B.E. MECHATRONICS ENGINEERING

CURRICULUM REGULATION-2022

CHOICE BASED CREDIT SYSTEM (CBCS)



ABOUT THE DEPARTMENT

- Established in the year 2013 with the intent of raising qualified Mechatronics Engineers who can make substantial contribution to the field of Mechanical, Electronics, Computer and Electrical Engineering.
- Alumni strength of more than 100 and they are working in reputed National and International Organizations.
- 4 Faculty members have registered for Ph.D. program.
- Publications in many National and International indexed Journals.
- Specially designed skill development programmes with support of industrial experts.
- Placement in many companies.
- Various technical clubs such as Design club and Product development club are actively functioning to impart specialized knowledge and skills to the students in various domains.

PROGRAMMES OFFERED

B.E. – Mechatronics Engineering- 4 years

VISION AND MISSION:

Vision

 To achieve excellence in the field of Mechatronics engineering education, research and innovative product development.

Mission

- To offer high-quality application-oriented education and prepare our graduates to become innovators in their profession
- To provide exposure to latest technologies through industry institute interaction.
- To motivate the students towards interdisciplinary research to cater to the local and global needs.
- To encourage innovation leading to development of industrial products with social responsibility.



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PEOs, POs and PSOs:

Programme Educational Objectives (PEOs)

PEO-1: Apply analytical skills and modeling methodologies to recognize, analyze, synthesize and implement operational solutions to engineering problems, product design and development, and manufacturing.

PEO-2: Design and develop the real – world Mechatronics products and processes for various applications.

PEO-3: Lead and contribute in a team entrusted with professional, social, ethical and entrepreneurial responsibilities.

Program Outcomes (POs)

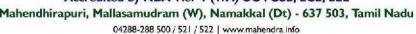
Engineering Graduates will be able to:

- 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Mahendra Engineering College (Autonomous) - Mechatronics Engineerin Syllabus - Regulation 2022



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- 9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering Graduates will be

PSO-1: Have ability to select appropriate sensors, actuators and control systems depending on application requirement for Industrial automation, Process control, Automotive electronics and MEMS.

PSO-2: Design and develop Mechatronics systems to solve the complex engineering problem by integrating Electronics, Electrical, Mechanical and Control & information systems.

PSO-3: Apply the specific knowledge for design and development of IoT, IIoT systems and Industrial robotics.



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		Regulation 2022					
		I Semester					
Sl. No.	Course Code	Course Title	Category	L	T	P	C
		THEORY		I			
1	22EN11001R	Communicative English	HS	3	0	0	3
2	22MA12101R	Engineering Mathematics- I	BS	3	1	0	4
3	22CY12001R	Chemistry for Engineering	BS	3	0	0	3
4	22ME33201	Engineering Graphics and Design	ES	3	0	2	4
5	22EE13102	Fundamentals of Electrical and Electronics Engineering	ES	3	0	0	3
6	22HS11001	Heritage of Tamils	MC	1	0	0	1
7	22SH61101	Induction Program	MC	-	-	-	-
		PRACTICAL					
8	22CY22001	Chemistry Laboratory	BS	0	0	3	1.5
9	22HS21001	Personality Development Practice Laboratory	HS	0	0	2	1
10	22EE23101	Fundamentals of Electrical and Electronics Engineering Laboratory	ES	0	0	3	1.5
		TOTAL		16	1	10	22



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		Regulation 2022									
		II Semester									
Sl. No. Course code Course Title Category L T											
		THEORY									
1	22MA 12201B	En sin sering Mathematics II	DC	2	1	0	4				
1	22MA12201R	Engineering Mathematics – II	BS	3	1	0	4				
2	22PY12001R	Engineering Physics	BS	3	0	0	3				
3	22CS13001	Problem Solving Techniques	ES	3	0	0	3				
4	22GE13201	Engineering Mechanics	PC	3	0	0	3				
5	22MT14201	Electronic Devices and Circuits	PC	3	0	0	3				
6	22HS11002	Tamils and Technology	HS	1	0	0	1				
		PRACTICAL									
7	22PY22001	Physics Laboratory	BS	0	0	3	1.5				
8	22CS23001	Problem Solving Techniques Laboratory	ES	0	0	3	1.5				
9	22GE24201	Computer Aided Drafting and Modeling Laboratory	PC	0	0	3	1.5				
		TOTAL		16	1	9	21.				



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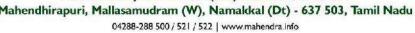
Regulation 2022

III Semester

		III Semester					
Sl. No.	Course code Course Title		Category	L	T	P	C
		THEORY					
1	22MA12303	Differential Equations and Numerical Methods	BS	3	1	0	4
2	22MT14301	Strength of Materials for Mechatronics	PC	3	1	0	4
3	22MT14302	Basics of Fluid Mechanics and Machinery	PC	3	0	0	3
4	22MT14303	Electrical Drives and Actuators	PC	3	0	0	3
5		Open Elective – 1	OE	3	0	0	3
6	22SH11006	Universal Human Values	HS	3	0	0	3
		PRACTICAL					
7	22MT24301	Strength of Materials Laboratory	PC	0	0	3	1.5
8	22MT24302	Fluid Mechanics and Machinery Laboratory	PC	0	0	3	1.5
9	22MT24303	Electrical Drives and Actuators Laboratory	PC	0	0	3	1.5
		TOTAL		18	2	9	24.5



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IV Semester

		TV Semester							
Sl. No.	Course code	Course Title	Category	L	Т	P	C		
		THEORY							
1	22MT14401	Kinematics and Dynamics of Machinery	PC	3	0	0	3		
2	22MT14402	Manufacturing Technology	PC	3	1	0	4		
3	22MT14403	Digital Principles and System Design	PC	3	0	0	3		
4		Professional Elective – 1	PE	3	0	0	3		
5	22AE15405	Basics of Mechanical Science	PE	3	0	0	3		
6	22MA12405	Numerical Logical and Visual Reasoning Skills	OE	3	0	0	3		
7	22CY11001	Environmental Science	BS	3	-	-	_		
		PRACTICAL							
8	22MT24401	Dynamics Laboratory	PC	0	0	3	1.5		
9	22MT24402	Manufacturing Technology Laboratory	PC	0	0	3	1.5		
10	22EN60001	Professional Communication Skills	EEC	0	1	1	2		
	TOTAL 21 2 7 24								



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V Semester

		V Schiester					
Sl. No.	Course code	Course Title	Category	L	T	P	C
l		THEORY					
1	22MT14501	Applied Hydraulics and Pneumatics	PC	3	1	0	4
2	22MT14502	Microprocessor and Microcontroller	PC	3	0	0	3
3	22MT14503	Automotive Electronics	PC	3	0	0	3
4		Professional Elective – 2	PE	3	0	0	3
5	22MA12501	Interpretation Analysis and Critical Thinking Skills	OE	3	0	0	3
6		Open Elective – 4	OE	3	0	0	3
		PRACTICAL					
7	22MT24501	Automation Laboratory	PC	0	0	3	1.5
8	22MT24502	Microprocessor and Microcontroller Laboratory	PC	0	0	3	1.5
9	22EN60002	Interview Skills and Soft Skills	EEC	0	1	2	2
'		TOTAL		18	2	8	24



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VI Semester

Sl. No.	Course code	Course Title	Category	L	Т	P	C
		THEORY					
1	22MT14601	Programmable Logic Controller & its Applications	PC	3	1	0	4
2	22MT14602	Virtual Instrumentation	PC	3	0	0	3
3	22MT14603	Automation in Food Processing and Technology	PC	3	0	0	3
4	22MBATS06	Managerial Skills, Project and Quality Management	HS	3	0	0	3
5		Professional Elective – 3	PE	3	0	0	3
6		Open Elective – 5	OE	3	0	0	3
7	22MC60001	Constitution of India	MC	3	-	-	-
		PRACTICAL					
8	22MT24601	PLC Laboratory	PC	0	0	3	1.5
9	22MT24602	Virtual Instrumentation Laboratory	PC	0	0	3	1.5
10	22MT34601	Presentation Skills and Technical Seminar	EEC	0	0	2	1
		TOTAL		18	1	7	23

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		VII Semester					
Sl. No.	Course code	Category	L	T	P	C	
		THEORY					<u>'</u>
1	22MT14701	Robotics and Industrial Automation	PC	3	1	0	4
2	22MT14703	Automation in Textile Industry	PC	3	0	0	3
3	22MT14704	CNC Machining Technology	PC	3	0	0	3
4		Professional Elective- 4	PE	3	0	0	3
5		Professional Elective- 5	PE	3	0	0	3
6		Professional Elective- 6	PE	3	0	0	3
		PRACTICAL		,			
7	22MT24701	Robotics Laboratory	PC	0	0	3	1.5
8	22MT24702	Computer Aided Design and Analysis Laboratory	PC	0	0	3	1.5
9	22MT34701	Project Work (Phase - 1)	EEC	0	0	6	3
		TOTAL		15	0	12	25

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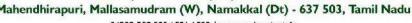


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	Regulation 2022										
	VIII Semester										
Sl. No.	L'allrea cada L'allrea Litta L'atagary I I I P L'										
		PRACTICAL									
1	22MT34801	Project Work (Phase – 2)	EEC	0	0	9	6				
		TOTAL		0	0	9	12				



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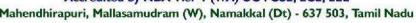
		CREI	DITS AS	S PER	SEMI	ESTER				% of
SUBJECT CATEGORY	I	II	III	IV	V	VI	VII	VIII	Credit Total	Credits (Actual Credits /Total Credits)
HS	4	-	3	-	3	-	-	-	10	6.09
BS	8.5	8.5	4	-	-	-	-	-	21	12.80
ES	8	4.5	-	-	-	-	-	-	12.5	7.62
PC	-	7.5	14.5	10	10	11.5	16	-	69.5	42.37
PE	-	-	-	3	3	3	3	6	18	10.97
OE	-	-	3	6	6	3	-	-	18	10.97
EEC	-	-	-	2	2	2	3	6	15	9.14
Non-Credit / Mandatory (MC)	-	-	-	-	-	-	-	-	-	-
Total	20.5	20.5	24.5	21	24	19.5	22	12	164	99.96

Legends Used:

- 1. HS-Humanities and Social Sciences
- 2. BS -Basic Sciences
- 3. ES -Engineering Sciences
- 4. PC-Professional Core
- 5. PE-Program Elective
- 6. OE-Open Elective
- 7. EEC Employability Enhancement Course
- 8. MC Mandatory Course



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PROFESSIONAL ELECTIVES

Sl. No.	Subject Code	Subject Name	Category	L	T	P	C
1	22MT15001	Sensors and Signal Processing	PE	3	0	0	3
2	22MT15002	Computer Aided Design	PE	3	0	0	3
3	22MT15003	Micro Electro Mechanical Systems	PE	3	0	0	3
4	22MT15004	Machine Vision and Image Processing	PE	3	0	0	3
5	22MT15005	Artificial Intelligence	PE	3	0	0	3
6	22MT15006	Engineering Economics and CostAnalysis	PE	3	0	0	3
7	22MT15007	Engineering Materials and Metallurgy	PE	3	0	0	3
8	22MT15008	Product Design and Development	PE	3	0	0	3
9	22MT15009	Safety Engineering	PE	3	0	0	3
10	22MT15010	Power Electronics	PE	3	0	0	3
11	22MT15011	Smart Manufacturing	PE	3	0	0	3
12	22MT15012	Design of Mechatronics Systems	PE	3	0	0	3
13	22MT15013	Industrial Electronics and Applications	PE	3	0	0	3
14	22MT15014	Embedded Systems Design	PE	3	0	0	3
15	22MT15015	Medical Mechatronics	PE	3	0	0	3
16	22MT15016	Engineering Thermodynamics	PE	3	0	0	3
17	22MT15017	Maintenance Engineering	PE	3	0	0	3
18	22MT15018	Entrepreneurship Development	PE	3	0	0	3



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19	22MT15019	Quality Control and ReliabilityEngineering	PE	3	0	0	3
20	22MT15020	Renewable and Non- RenewableEnergy Resources	PE	3	0	0	3
21	22MT15021	Building Automation	PE	3	0	0	3
22	22MT15022	Modeling and Simulation	PE	3	0	0	3



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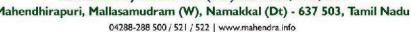


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I SEMESTER



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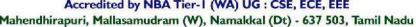


Regulation 2022 I Semester Sl. **Course Code** Category L T P \mathbf{C} No. **Course Title THEORY** 1 22EN11001 Communicative English HS 3 0 0 3 2 22MA12101 BS 3 Engineering Mathematics- I 1 0 4 3 22CY12001 Chemistry for Engineering BS 3 0 0 3 4 22GE13001 **Engineering Graphics and Design** ES 3 0 2 4 Fundamentals of Electrical and Electronics 5 22EE13102 ES 3 0 2 4 Engineering **Induction Program** MC PRACTICAL 6 BS 0 0 3 1.5 22CY22001 Chemistry Laboratory 7 HS 0 0 2 1 22EN21001 Personality Development Practice Laboratory TOTAL 15 1 9 20.5

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Department	Mechatronics	Progr	amme ode	,		1101
	I Semest	er				
Course code	Course Name	Н	ours/w	eek	Credit	Maximum marks
		L	T	P	C	100
22EN11001	COMMUNICATIVE ENGLISH	3	0	0	3	100
Objective(s)	 To enable the students to: To help learners to improve their To enable them to use vocal professional contexts. To support learners to acquire list To facilitate them to develop the reading strategies. To equip them with writing sk context. At the end of the course, learners will be	bulary ening a ir read ills nea	appro nd spe ing ski	priatel aking lls by or aca	ly in diff skills. familiariz ndemic as	ing different types of well as professional
Outcome(s)	 Recognize and comprehend the property of the desired property of the	words n correct h emer	approp et usage ging te	oriately e of gr echnolo	y in differe cammar ogy	ent academic contexts.
UNIT - I						(9)
Speaking – Intra Reading – Ski Questions. Writing - Leave	ening to Short Conversations (Formal and I oducing Oneself and Others. mming and Scanning-Reading Comprehe e/On Duty application, Bonafide Certificate ocabulary – Parts of Speech, Articles, Preserved	ension e-requis	Passa,	Check		
	tening to Telephonic Conversations.					(9)
Speaking – Gree Reading – Pred Writing - Recon	etings and Welcome Address. icting the Content of a Given Article – New amendations, Composing E-Mail, Letter Wocabulary – Sentence Pattern, Tenses, Brid	riting-	Invitat	ion le		ivalents. (9)



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Listening - Listening to Talks and Note taking.

Speaking – Role Play.

Reading –Cloze Reading and Fill up the Gaps.

Writing - Letter Writing - Permission Letter (In-Plant Training/Industrial Visit), Business letters- Calling for Quotation and Placing Order.

Grammar & Vocabulary –If Conditionals, Abbreviations and Acronyms.

UNIT - IV (9)

Listening - Listening to Situation Based Dialogues.

Speaking – Talking part in Casual Conversation.

Reading - Reading Advertisements.

Writing – Paragraph Writing, and Job Application.

Grammar & Vocabulary – Concord, Gerunds and Infinitives, Synonyms and Antonyms.

UNIT - V (9)

Listening – Listening to Academic lectures.

Speaking - Describing Objects.

Reading – Transcoding (Conversion of Flow Chart, Bar chart, Pie chart into a paragraph).

Writing – Review writing (Films & Books), Essay Writing.

Grammar & Vocabulary - Modal Verbs, Voice- Active Voice, Passive Voice and Impersonal Passive,

Question tags and Nominal Compounds.

	Total hours to be taught	45 Periods						
TEXT	BOOK:							
1	N.P.Sudharshana and C.Savitha, <i>English For Technical Communication</i> , Cambridge University Press, New Delhi, 2016.							
2	Murphy, Raymond, <i>English Grammar in Use</i> , Fifth Edition. Cambridge University Press, New Delhi, 2019.							
REFE	RENCE:							
1	Meenakshi Raman and Sangeeta Sharma., <i>Technical Communication: Principles and Practice, Third Edition</i> . OUP, New Delhi, 2015.							
2	Ashraf Rizvi. Effective Technical Communication, Tata McGrav	w Hill, 2017.						
3	Jack C. Richards with Jonathan Hull and Susan Proctor, <i>Interchange</i> . 4 th Edition, Cambridge University Press, New Delhi, 2016.							
Extens	ive Reading:							
1	Khera, Shiv. You can Win. Macmillan, Delhi. 1998.							



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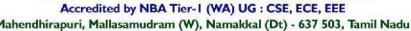


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Webs	Websites:					
1	http://www.englishclub.com					
2	http://www.talkenglish.com					
3	https:// www.ted.com/talks					
4	https://nptel.ac.in/					



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Department	Mechatronics	Programme Code				1101			
	I Semeste	r							
Course code	Course Name	Но	ours/w	eek	Credit	Maximum Marks			
	ENGINEERING	L	T	P	C	100			
22MA12101	MATHEMATICS-I	3	1	0	4	100			
	To enable the students to:								
Objective(s)	• Learn the types of matrices and linear algebra in a comprehensive manner.								
Objective(s)	• Familiarize with functions of several variables, which is applied electrical and communication branch engineering.								
	Define the geometric aspects of curvature, radius of curvature, evolutes and								
	envelopesas application of differential calculus.								
	• Explain different types of higher order ordinary differential equations with								
	variable coefficients and various methods to solve the equations.								
	• Learn the double and triple integrals and give their representation as area								
	and volume.								
	At the end of the course the students w	ill be a	ble to:						
Outcome(s)	• Solve the system of equations and determine rank, Eigen values, Eigen vectors and inverse of a given matrix and diagonalise symmetric matrix								
	by orthogonal transformations				•				
	Illustrate maxima and minima	function	ons of s	several	variables.				
	 Apply the concepts of different 	ntial cal	culus i	n phys	ical proble	ms.			
	• Solve the higher order differential equations with variable coefficients.								
	Compute the area and volume	by usin	g mult	iple int	tegrals.				
UNIT-I	MATRICES					(9+3)			

Matrix and its types – Rank of matrix - Characteristic equation - Eigen values and Eigen vectors of the matrix - Cayley-Hamilton Theorem, Diagonalization of real and symmetric matrices by Orthogonal transformation – Reduce the quadratic form to canonical form.

UNIT-II DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES (9+3)

Differentiation of implicit functions – Partial derivatives – Total derivative – Euler's theorem – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.



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	V-200-200 3007 3217 322 WWW.mariendra.mio							
UNIT-I	III APPLICATIONS OF DIFFERENTIAL CALCULUS (9+3)							
Curvatu	Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes							
– Envel	opes – Evolute as envelope of normals and their properties.							
UNIT-I	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS (9+3)							
variatio	and Higher order linear differential equations with constant coefficients – Method of n of parameters – Cauchy Euler equation, Legendre's type differential equations – System ltaneous linear differential equations with constant coefficients.							
UNIT-V	W MULTIPLE INTEGRALS (9+3)							
Double integrals in Cartesian co-ordinates – Change of order of integration – Area as double integral – Triple integral in Cartesian co-ordinates – Volume as triple integral – Change of variables in double integrals.								
	Total hours to be taught (L:45+T:15): 60 Periods							
TEXT I	BOOKS:							
1	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2018							
2	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44 th Edition, 2017.							
3	G.Balaji, Engineering Mathematics – I, G.Balaji Publication, 3 rd Edition, 2015.							
REFER	RENCE:							
1	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.							
2	Erwin kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Wiley & Sons, 2016.							
3	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 th Reprint, 2016.							
4	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Ninth Edition, 2014.							



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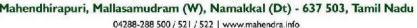
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Departmen	nt Mechatronic	es	Pı	ogramn	ne Code	1101			
		I Sen	nester						
Course code	Course Name	Н	ours/w	eek	Credit	Maximum marks			
22CY12001	CHEMISTRY FOR	L	T	P	С	100			
220112001	ENGINEERING	3	0	0	3	100			
	To make the students familia	ar with :							
	• The treatment of v	vater for	potab	le and in	dustrial purpos	ses.			
Objective(s)	• Provides students with an opportunity to identify different types of polyme our surroundings.								
	The basic principles and preparatory method of Nanomaterial.								
	 Different types of batteries with Construction and application. 								
	The principles of corrosion and control techniques.								
	At the end of the course the student will be able to								
	• Explain the basic principles of water quality parameters, their analysis and various								
					nd industrial ap	=			
Outcome(s)	 Classify the reaction r 	nechani	sm, sy	nthesis a	nd application	of polymers.			
()	-	-				nology in designing th			
	nanomaterial for Engineering and Technology.Compare the working principles of batteries and Super capacitors with recycling								
	• Compare the working methods.	; princip	oles of	batteries	s and Super Ca	ipacitors with recyclin			
	 Inspect the principles of corrosion in metals with control measures. 								
UNIT-I	WATER TECHNOLOGY		SIOH H	11101415	Control III	(9)			

Water: Sources and impurities - Water quality parameters - Definition and significance of - colour, odour, turbidity, pH, hardness, alkalinity, flouride and arsenic - Domestic water treatment - disinfection methods (Chlorination, ozonation, UV treatment) - Boiler feed water - requirements - Decreased efficiency of using hard water in boilers - external conditioning - demineralization process, Electro dialysis process, reverse osmosis - Internal conditioning (phosphate, calgon and carbonate conditioning methods) - WHO and BIS guidelines for drinking water.



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UNIT-II POLYMER CHEMISTRY (9)

Introduction: Classification of polymers – Natural and synthetic - Thermoplastic and Thermosetting - Functionality – Degree of polymerization - Types and mechanism of polymerization: Addition (Free Radical); condensation and copolymerization - Properties of polymers: Tg, Tacticity, Molecular weight - weight average, number average and polydispersity index - Preparation, properties & applications of selected commodity and engineering polymers (Polystyrene, Teflon, Bakelite and Epoxy resin).

UNIT-III NANOCHEMISTRY

Introduction: Basics - difference between molecules, nanoparticles and bulk materials - size-dependent properties (optical, electrical, mechanical and magnetic) - Types of nanomaterials: Definition, properties and uses of –nanoparticles, nanocluster, nanorod, nanotube and nanowire - Synthesis of nanomaterials: laser ablation, Chemical vapour deposition, electro deposition, precipitation, hydrothermal - Applications (Medicine, Agriculture and Electronics).

UNIT-IV ENERGY STORAGE DEVICE

(9)

(9)

Types of batteries - Primary battery - dry cell - Secondary battery - lead acid battery and Lithium ion batteries- Fundamentals, Construction and application - Thin Film solid state batteries - Recycling of Na-Air batteries - Battery used in EV application - Super Capacitors(Storage principle and types).

UNIT-V CORROSION & ITS CONTROL

(9)

Corrosion: Chemical corrosion – Pilling Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion - Vapour Deposition Techniques - Physical and Chemical Vapour Deposition – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion Inhibitors.

Total hours to be taught | 45 Periods

TEXT BOOKS:

- 1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
- 2. Dr.C.K.Charles and Dr.G.Ramachandran, "Applied Chemistry", CARS Publishers, Chennai, 2015.
- 3. David Linden and Thomas B. Reddy "Handbook of Batteries", Third Edition McGraw-Hill New York.

REFERENCE:

- 1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
- 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
- 3. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.



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Department	Mechatronics	Programme Code				1101			
	I Semes	ter							
Course code	Course Name	Ho	ours/w	eek	Credit	Maximum marks			
22GE13001	ENGINEERING GRAPHICS	L	T	P	C	100			
22GE13001	AND DESIGN	3	0	2	4	100			
	To make the students familiar with:								
Objective(s)	• Increase ability to communicate with people through drawing skills as per the BIS standard.								
Objective(s)	 Learn to sketch and take field dimensions. 								
	 Learn to take data and transform it into graphic drawings. 								
	 Learn basic Auto Cad skills. 								
	Learn basic Engineering Drawing form								
	At the end of the course the student will be able to								
Outcome(s)	 Indicate proper dimensions on drawings will improve 								
Outcome(s)	Perform basic sketching techniques will improve.								
	Familiar with office practice and standards.								
	Familiar with Auto Cad two dimensional drawings.								
	• Improve their visualization skills so that they can apply these skills in developing new								
	products.	THEO	DETI	CATI	MODE				
	EXAMINATION PATTERN:			CAL	MODE	(0)			
UNIT-I	PLANE CURVES AND FREE HAND SK	KETCH	IING			(9)			

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing Visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT-II PROJECTION OF POINTS, LINES AND PLANE SURFACES (9)

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.



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	EXAMINATION PATTERN: PRACTICAL MODE						
UNIT-	UNIT-III PROJECTION OF SOLIDS						
	ion of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined y change of position method.	to one reference					
UNIT-I	V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	(9)					
planes a simple a with cut	ing of above solids in simple vertical position when the cutting plane is inclined to the orand perpendicular to the other – obtaining true shape of section. Development of land sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral stouts and holes.	ateral surfaces of surfaces of solids					
UNIT-V		(9)					
	es of isometric projection – isometric scale – isometric projections of simple solids, tr ls, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visu						
	Total hours to be taught 45 Peri	iods					
1. Bette suit 2. Lice	quipments: er hardware, with able graphics facility nsed software for Drafting and Modeling. er Printer or Plotter to print / plot drawings -30 No - 30 Licenses - 1 No						
TEXT	BOOKS:						
1	N S Parthasarathy and Vela Murali, "Engineering Drawing" Oxford University Press 20	015.					
2	K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) I	Limited, 2011.					
3	K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Che	nnai, 2012.					
	M.S. Kumar, "Engineering Graphics", D.D. Publications, 2010.						
	RENCE:						
	M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education 2005.						
2	K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications 1998.						
3	Limited, New Delhi, 2008.						
4	Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Ta Publishing Company Limited 2008.	nta McGraw Hill					



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Department	Mechatronics	gramme Code	1101			
	I Semester					
Course	Course Name	Но	ours/V	Veek	Credit	Maximum
Code	Course Name	L	L T P		C	Marks
22EE13102	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING (Integrated Course)	3	0	2	4	100
Objective	 To make the students familiar with: To learn the concepts of DC circuits and wiring connections. To understand the basic concepts of Semiconductor Device To develop skills to interface I/O devices such as keyboard, display, Traffic light, Programmable Interface I/O and DAC with 8051 					
Outcomes	 At the end of the course the student will be able to Illustrate the concepts of DC circuits to compute Voltage Describe the constructional features and working princip Discuss the characteristics and control schemes of Electrical Explain the functions of semiconductor devices and mic Design the microcontroller based systems for practical a 	ole of El rical dri rocontro	lectric ves ollers			
UNIT I	BASIC CIRCUITS AND DOMESTIC WIRING					(9)

Electrical circuit elements (R, L and C)-Dependent and independent sources – Ohm's Law- Kirchhoff's laws - mesh current and node voltage methods (Analysis with only independent source) - Phasors – RMS-Average values-sinusoidal steady state response of simple RLC circuits. Types of wiring- Domestic wiring - Specification of Wires-Earthing-Methods-Protective devices.

UNIT II ELECTRICAL MACHINES AND DRIVES (9)

DC generator Constructional details – EMF equation- Methods of excitation- Principle of operation of D.C. motor – Back EMF and torque equation – Starting of D.C. motors – Three phase and Single phase induction motors(only qualitative treatment)- Types of Electric Drives- Speed-Torque characteristics of various types of load and drive motors- Speed Control Of Electrical Drives(Qualitative Approach Only)

UNIT III SEMICONDUCTOR DEVICES AND MICROCONTROLLERS	(9)
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Basic Electronic Components: Resistance - Inductor - Capacitor -Types, Functions, Symbols - Color coding of Resistance - Review of insulator, conductor and semiconductor -Semiconductor types - Drift and Diffusion Currents - Study of CRO-Construction of PN junction diode- V-I characteristics of PN junction diode- Zener diode as voltage regulator - Biasing LED-Switch mode Power Supply-8051 Architecture and Programming- PIC Microcontroller



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LIST OF EXPERIMENTS	
Assembly Language Programming for arithmetic operations using 8051	
Assembly Language Programming for control instruction (Increment/Decrement, Ascending/ Descending order) using 8051	
Traffic Light Interface	(18)
Keyboard Interface	(10)
Display Interface	
Stepper motor controller interface	
Total Hours to be taught	45 Hours
Charles K. Alexander and Mathew N.O. Sadiku, Fundamentals of Electric Circuits, 5 th e Hill,2019.	dition, McGraw-
Joseph Edministor and Nahvi (Mohmood), 'Theory & Problems of Electric Circuits', 5th edition 2020.	on, McGraw Hill,
V.K Mehta and Rohit Mehta, 'Principle of Electrical Engineering' S Chand & Company, 2	2008.
Rajkamal, "Microcontrollers Architecture, Programming Interfacing, & System Design", Pearso	n,2012
Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7 th Edit	tion, 2006.
J. Millman & Devices & Devices & Circuits', Tata McGrav Edition, 2008.	w Hill, 2 nd
John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000	
	Assembly Language Programming for arithmetic operations using 8051 Assembly Language Programming for control instruction (Increment/Decrement, Ascending/ Descending order) using 8051 Traffic Light Interface Keyboard Interface Display Interface Stepper motor controller interface Total Hours to be taught Charles K. Alexander and Mathew N.O. Sadiku, Fundamentals of Electric Circuits, 5th edition (1909) Joseph Edministor and Nahvi (Mohmood), 'Theory & Problems of Electric Circuits', 5th edition (2020) V.K Mehta and Rohit Mehta, 'Principle of Electrical Engineering' S Chand & Electric Circuits', Pearson Education, 7th Edit Indiana, 'Microcontrollers Architecture, Programming Interfacing, & System Design', Pearson Education, 7th Edit Indiana, Edition, 2008.



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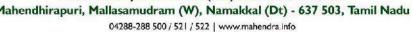


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Dej	partment	artment Mechatronics Programme Code		ne	1101			
		I Semester						
(Course		Ho	urs/W	/eek	Credit	Maximum	
	Code	Course Name	L	Т	P	C	Marks	
220	CY22001	CHEMISTRY LABORATORY	0	0	3	1.5	100	
	jective(s)	 To make the students familiar with: Educate the theoretical concepts e To impart skills in measurements. To design and plan the experim process the results. To reach non trivial conclusions of On completion of this course, students with Demonstrate laboratory practices, chemical reagents. Experiment with different types of using small quantities involved for analyze different types of titration quantities involved for good result. 	ental profession of signification of signification of the significant significant for estimated to the significant of the signi	cant of the king glasses and actimate	of the conowled sware for an ecurate	experiment edge in e, equipme alysis of n	nt, and	
1.	Determina	LIST OF EXPERIMATION OF Total, Temporary & Permanent has			ter usi	ng EDTA	method	
2.		ation of the Alkalinity level of a water san						
3.		ation of Chloride content of water sample		entom	etrv.			
4.		ation of DO content of water sample using						
5.		Determination of Rate of Corrosion of Mild steel by Weight loss method.						
6.	Determination of molecular weight of polyvinyl alcohol using Viscometry.							
7.	Estimation of Iron content of the given solution using Potentiometry.							
8.	Determination of strength of given hydrochloric acid using pH meter.							
9.	Conducto	metric titration a strong acid vs strong bas	e.					
10.	Determination of strength of acids in a mixture using Conductometry.							



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11.	Estimation of sulphate in a solution using Conductometry.
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Estimation of iron content of the water sample using Spectrophotometry. (1,10-phenanthroline / thiocyanate method) – (**DEMO ONLY**)

Total hours to be taught	45 Periods
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TEXT BOOK

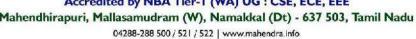
- 1. Chemistry lab Manual, Department of Chemistry, Mahendra Engineering College, Mallasamudram, 2019.
- 2. Chemistry lab Manual, Department of Chemistry, Mahendra Engineering College, Mallasamudram, 2017.

REFERENCE

- 1. Applied chemistry theory and practice by O. P. Vermani and A. K. Narula, second edition.
- 2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore (1996).
- 3. Kolthoff I.M. and Sandell E.B. et al. Quantitative chemical analysis, Mcmillan, Madras 1980.



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Department		Mechatronics	Programme Code				1101	
I Semester								
Course code		Course Name	Hours/week			Credit	Maximum marks	
22EN21001		Personality Development Practice Laboratory		T P		C	100	
• To develop listening and speaking skills of students for a				rviews and students for				
At the end of the course, the students will be able to Understand the language proficiency and its techniques. Prepare the resume with organized details. Develop soft skills to excel in their career.								
1	T4	LIST OF EXERC	CISES					
1.		oduction to LSRW Skills						
2.		ening Comprehension						
3.	Read	ding Comprehension						
4.	Con	nmon Errors in English						
5.	Interview Skills							
6.	Presentation skills							
7.	Body Language							
8.	Group Discussion							
9.	Soft Skills							
10.	10. Innovation and Creative Writing							
	·	Total	hours	s to be	taug	ht	45 Periods	



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II SEMESTER



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		Regulation 2022						
II Semester								
Sl. No.	Course code	Course Title	Category	L	Т]	P C	
THEORY								
1	22MA12201R	Engineering Mathematics – II	BS	3	1	0	4	
2	22PY12001R	Engineering Physics	BS	3	0	0	3	
3	22CS13001	Problem Solving Techniques	ES	3	0	0	3	
4	22GE13201	Engineering Mechanics	PC	3	0	0	3	
5	22MT14201	Electronic Devices and Circuits	PC	3	0	0	3	
6	22HS11002	Tamils and Technology	HS	1	0	0	1	
		PRACTICAL						
7	22PY22001	Physics Laboratory	BS	0	0	3	1.5	
8	22CS23001	Problem Solving Techniques Laboratory	ES	0	0	3	1.5	
9	22GE24201	Computer Aided Drafting and Modeling Laboratory	PC	0	0	3	1.5	
		TOTAL		16	1	9	21.5	





method.

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Programme Department Mechatronics 1101 Code **II Semester** Maximum Course code **Course Name** Hours/week Credit marks L \mathbf{T} \mathbf{C} **ENGINEERG MATHEMATICS - II** 22MA12201 100 (Common to all Branches) 4 To enable the students to: Define vector function, operators and working procedure to evaluate line, surface and volume integrals. • Learn Laplace transform, inverse Laplace transform and its properties to solve differential equations. **Objectives** Learn about Fourier transforms, inverse Fourier transform and its properties and apply convolution theorem and Parseval's identity to various functions Know about functions of a complex variable, properties and problems involving conformal mapping. Learn about Taylor's and Laurent's series expansion of complex functions and the process of evaluating complex integrals. At the end of the course the students will be able to Solve problems related to vector differentiation, line, surface and volume integrals and theorems involving them. Describe Laplace transform and its properties inverse Laplace transform and the solution of linear differential equation using Lpaplace transform techniques. Solve Fourier transforms, inverse Fourier transform and its properties and apply Outcomes convolution theorem and Parseval's identity to various functions Solve Analytic functions, harmonic functions, conformal mapping and its applications. Expand the functions as Taylor's and Laurent's series and evaluate the complex integrals. **UNIT-I VECTOR CALCULUS** (9+3)Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs). Verification and application in evaluating line, surface and volume integrals. UNIT -II LAPLACE TRANSFORM (9+3)Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem, solving ODEs by Laplace Transform

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COLLEGE

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UNIT-III	FOURIER TRANSFORMS
-----------------	--------------------

(9+3)

Fourier integral theorem (statement only)-Fourier transform pair (infinite) - Sine and cosine transforms-Properties-Transform of simple functions-Convolution theorem- Parseval's identity.

UNIT-IV ANALYTIC FUNCTIONS

(9+3)

Functions of a complex variable, Cauchy-Riemann equations – Analytic functions – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w = z + c, cz, 1/z, and Bilinear transformation.

UNIT-V COMPLEX INTEGRATION

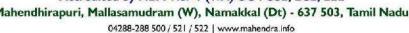
(9+3)

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula(without proof) – Taylor and Laurent expansions –Types of Singularities-Singular points – Residues – Residue theorem(without proof) – Application of residue theorem to evaluate real integrals – Contour integration.

Contour	megration.					
	Total hours to be taught	(L:45+T:15): 60 Periods				
TEXT B	OOKS					
1	Veerarajan T., Engineering Mathematics for first year, Tata	McGraw-Hill, New Delhi, 2018.				
2	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44 th Edition, 2017.					
REFERENCE						
1	V. Krishnamurthy, V. P. Mainra and J. L. Arora, "An introduction to Linear Algebra", Affiliated East-West presses, 2005.					
2	Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2016.					
3	Ramana B.V., Higher Engineering Mathematics, Tata McG 2010.	raw Hill New Delhi, 11 th Reprint,				
4.	N.P. Bali and Manish Goyal, A text book of Engineering M. Ninth Edition, 2014.	Iathematics, Laxmi Publications,				



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Department	Mechatronics	Programme Code		110)1		
	II Semester						
Course code	Course Name	Hours/week		Hours/week C		Maximum marks	
22PY12101	ENGINEERING PHYSICS (Common to all Branches)	L 3	T 0	P 0	C 3	100	
Objective(s)	 To enable the students to: To provide students with a fundamental knowledge of physics, together with problem-solving skills Understanding of Basics of Physics about lasers, Acoustics, Properties of matter, Semiconductor Physics and Quantum Physics. How these are used in information and communication technology. 						
Outcome(s)	 At the end of the course the students will be able to: Understand the basics of Laser, Fiber Optics and its types with its applications in various fields. Gain knowledge about Acoustics and Ultrasonic's their applications in 						
UNIT - I	LASER AND FIBER OPTICS					(9)	
Introduction –	Principle of spontaneous emission, stimu	lated	absor	ntion a	and emission	on – Einstein's	

Introduction – Principle of spontaneous emission, stimulated absorption and emission – Einstein's coefficient (derivation) – Types of lasers - CO₂, Nd: YAG – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index and mode) – losses associated with optical fibers - fiber optic sensors: pressure and displacement.

UNIT - II ULTRASONICS AND ACOUSTICS (9)

Introduction – Production – magnetostriction effect - magnetostriction generator – piezoelectric and inverse piezoelectric effect- piezoelectric generator – properties – Cavitations - Velocity measurement – acoustic grating – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C –scan displays.

Classification of sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies.



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45 Periods

UNIT - III PROPERTIES OF MATTER (9) Electicity Street strain diagram and its uses feature effecting electic modulus and tancils stranger

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT - IV QUANTUM PHYSICS (9)

Black body radiation – Planck's theory (derivation) –wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – scanning tunneling microscope- electron tunneling microscope.

UNIT - V SEMICONDUCTOR PHYSICS (9)

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier Concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors. Photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes.-Photovoltaic applications: domestic lighting, street lighting, water pumping etc - solar PV power plant.

Total hours to be taught

	Total hours to be taught 42 Terrous					
TEXT	BOOKS					
1.	Dr. Palanisamy P.K, "Engineering Physics", Scitech Publications, Chennai, 2010.					
2.	A.S. Vasudeva-Modern Engineering Physics-S. Chand & Co, New Delhi-1998- Second edition 2003.					
3.	Wahab, M.A. Solid State Physics: Structure and Properties of Materials. Narosa Publishing House, 2009.					
REFE	RENCE					
1.	Pillai S O, "Engineering Physics", New Age International Publishers, New Delhi, 2005.					
2.	Satyaprakash-Engineering Physics-Pragati Prakashan, Meerut-I Edition 2003.					
3.	Dr.M.Arumugam-Engineering Physics - Anuradha Agencies, Kumbakonam-III Revised Edition 2002.					
4.	D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.					



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	04288-288 500 / 521 / 522 ww	w.mahen	dra.info						
Department	partment Mechatronics Programme Code			11	01				
II Semester									
Course code	Course Name	Hours/week Cre			Hours/week		week	Credit	Maximum marks
220012001	PROBLEM SOLVING	L	T	P	C	100			
22CS13001	TECHNIQUES (Common to all Branches)	3	0	0	3	100			
	To enable the students to:								
	• Understand the basics of algorithm	c pro	blem s	solving.					
Objectives	• Understand the basic concepts of C	Prog	rammi	ng.					
	 Learn the arrays and functions in C 	1							
	Be familiar with pointers and struc								
	• Understand the file handling techn			reproces	ssors in C.				
	At the end of the course the students will Develop Algorithms for real times			through	h vorious l	Problem colving			
	techniques.	ie pro	JUICIIIS	unoug	ii various i	Floblem solving			
0.4	Define the syntax of C Programm	ning.							
Outcomes	■ Summarize the use of funct	_	and	pointers	in prog	programming in C			
	programming concepts.								
	• Apply the concepts of pointers a								
UNIT-I	 Describe the fundamental concert PROBLEM SOLVING ASPECTS 	ots of	mes a	na prep	rocessors	(9)			
			•	a . t	D 11				
strategies for de problems: Exch Fibonacci Seque	ng Aspects: Algorithms Pseudo code, leveloping algorithms (iteration, recursion nanging The Values-Counting-Find minence. C PROGRAMMING BASICS	n)- P	rogran	nming r	nethodolog	gies - Illustrative I Computation -			
UNIT-II			· ~		••	(9)			
	C programming – Header files – Structu		_	_	-	_			
	onstants, Variables – Data Types – E cision Making and Branching – Looping								
UNIT-III ARRAYS AND FUNCTIONS (9)									
Arrays: Introdu	uction – One-Dimensional Arrays - T	wo-L	Dimens	ional A	rrays - N				
•	s: Operations of Strings. Function – defi				•				
_	type - Types of functions - Pass by	valı	ue – I	Pass by	reference	Recursion -			
Programming Examples									



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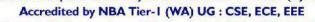
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UNIT	-IV POINTERS AND STRUCTURES	(9)					
	Pointers - Definition - Initialization - Pointers and arrays- Introduction to Structure - Structure definition - Structure declaration - Structure within a structure- Unions - Storage classes.						
UN	UNIT-V FILE PROCESSING AND PREPROCESSORS (9)						
argum	Files: File modes - File functions - File operations - Text and Binary files, Command Line arguments - C Preprocessor directives: Macros - Definition - types of Macros - Creating and implementing user defined header files.						
	Total hours to be taught 45 Periods						
TEXT	BOOK						
1	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Kindersley (India)Pvt. Ltd. Pearson Education, 2011.	Dorling					
REFEI	RENCES						
1	Dromey R.G, "How to Solve it by Computer" Prentice Hall of India, Delhi., 2010.						
2	E Balagurusamy, "Computer Programming", First Edition, Tata McGraw Hill Education Private Ltd, New Delhi., 2013.	(India)					
3	Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition University Press., 2013.	, Oxford					
4	M.Rajaram and P.Uma Maheshwari "Computer Programming with C", Pearson Education., 2013.						
5	NPTEL course, Problem Solving Through Programmi Through Programming https://nptel.ac.in/courses/106105171	in C,					
6	NPTEL course, Introduction to Programming in C, https://nptel.ac.in/courses/106104128						

COULEGE

MAHENDRA ENGINEERING COLLEGE

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Department	Mechatronics	Programme Code 1101			.01																																														
II Semester																																																			
Course code	Course Name	Hours/week			Hours/week			Hours/week			Hours/week			Hours/week			Hours/week			Hours/week		Credit	Maximum marks																												
22GE13201	ENGINEERING MECHANICS	L T P 3 0 0				C 3	100																																												
Objective(s)	 To understand the basic concepts required for analyzing static structures model problems using free-body diagrams and accurate equilibrium equations. To calculate the reactive forces on the structural members. To know the geometric properties of the different cross sections on the structural members. To get the exposure on laws of mechanics, work energy and momentum methods for finding the motion parameters. 																																																		
Outcome (s)	 At the end of this course, Student will be able to Analysis the engineering problems in case of equilibrium conditions. Calculate the reaction forces of various supports on the structural members. Evaluate various geometrical properties like centroid, centre of gravity, Moment of Inertia of various surfaces and solids. Solve the problems involving dynamics of particles and rigid bodies. Realize about the friction using simple mechanisms. 																																																		
UNIT-I	STATICS OF PARTICLE					9)																																													

Introduction to Mechanics – Fundamental Principles – Laws of Mechanics, Lame's theorem, Parallelogram and triangular Law of forces- Vectorial representation of forces and moments, Coplanar forces- Resolution and Composition of forces – Equilibrium of particles - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force.

UNIT-II STATICS OF RIGID BODY (9)

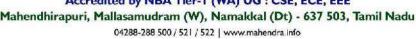
Free body diagram – Types of supports and their reactions-requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis– Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force - Equilibrium of Rigid bodies in two dimensions.



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UN	IT-III PROPERTIES OF SECTIONS	(9)						
Centro	oid – Rectangular, circular, triangular areas by integration – T section, I section,	- Angle section,						
Hollov	Hollow section by using standard formula – Theorems of Pappus and Guldinus – Second moment of							
area –	- Rectangular, circular, triangular areas by integration - T section, I section,	Angle section,						
Hollov	w section by using standard formula -Parallel axis theorem and perpendicular	axis theorem -						
Produc	ct of inertia of plane areas – Polar moment of inertia – Principal axes.							
UN	IT-IV DYNAMICS OF PARTICLES	(9)						
Displa	cements, Velocity and acceleration, their relationship – Relative motion – Curvil	inear motion –						
	n's law - Work Energy Equation of particles - Impulse and Momentum - Im							
bodies	- Impact - direct and central impact - coefficient of restitution. D'Alembert's princi	iple.						
UN	NIT-V FRICTION	(9)						
Frictio	on force – Laws of sliding friction – equilibrium analysis of simple systems with sli	iding friction –						
wedge	friction - Rolling resistance. Applications of screw jacks and belts.							
	Total hours to be taught 45 Periods	 }						
TEXT	BOOKS:							
1	R.C. Hibbeller, "Engineering Mechanics – Statics and Dynamics", 11 th ed., Pear	rson Education						
1	Asia Pvt. Ltd., 2009.							
2	Ferdinand P. Beer, E. Russell Johnston, Vector Mechanics for Engineers	s: Statics and						
2	Dynamics (9th Edition), Tata McGraw-Hill International Edition, 2010.							
3	Dr.N.Koteeswaran, "Engineering Mechanics Statics and Dynamics", Sri Bala	ji Publications						
	9 th Rv.Ed. S.Chand & Co Ltd, 2013.							
4	Vela Murali, "Engineering Mechanics", Oxford University Press 2010.							
REFE	RENCE:							
1	M.S. Palanichamy and S. Nagam, "Engineering Mechanics – Statics & Dynamics", 3 rd e Hill, 2004.	ed., Tata McGraw						
2	S. Rajasekaran, G. Sankarasubramanian, "Fundamentals of Engineering Mechanics Publishing House Pvt. Ltd, 2009.							
3	Kumar, K.L., "Engineering Mechanics", 3 rd Revised Edition, Tata McGraw-Hill Pub New Delhi 2008.	olishing company						
4	Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", 4 th ed., – Pearson	on Education Asia						



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Programme Department Mechatronics 1101 & MCT Code & Name **II Semester** Course code **Course Name** Hours/week Credit **Maximum marks** T P C **ELECTRONIC DEVICES** L 22MT14201 100 AND CIRCUITS 3 0 3 To understand Kirchoff's Laws, Network theorems and their applications. To understand the behavior of RL, RC, and RLC circuits under transient Objective(s) conditions. To distinguish the concept of intrinsic and extrinsic semiconductors, including their doping mechanisms and electrical properties. To explore the fundamental principles underlying the operation of PNP and NPN transistors. To recognize the applications of LEDs and LCDs in displays, indicators, and lighting systems. At the end of this course, Student will be able to Outcome(s) Explain Kirchoff's law and Network theorems for their significance in analyzing electric circuits. • Apply the transient responses in RL, RC, and RLC Circuits. • Interpret the current-voltage characteristics of PN junction diodes. Illustrate the characteristics of CE, CB, and CC transistor configurations and understand their respective applications. Demonstrate a thorough understanding of the principles of operation and characteristics of special semiconductor devices. **UNIT-I CIRCUIT ANALYSIS TECHNIQUES (9)** Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality - Star-delta conversion. **UNIT-II** TRANSIENT RESONANCE IN RLC CIRCUITS **(9)** Basic RL, RC and RLC circuits and their responses to pulse inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

SEMICONDUCTOR DIODES

UNIT-III

OOLEGE

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UNIT-	-IV	TRANSISTORS		(9)			
	Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-						
		Channel JFET – drain current equation – MO and operation – comparison of BJT with MOSI					
UNIT	-V	SPECIAL SEMICONDUCTOR DEVICES		(9)			
	Tunnel diodes – PIN diode – SCR characteristics and two transistor equivalent model – Diac and Triac - Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.						
		Total hours to be taught	4	45 PERIODS			
TEXT 1	BOOK:						
1	Joseph A Hill, (20	A. Edminister, Mahmood, Nahri, "Electric Cir 01).	cuits" – Shaum series,	Tata McGraw			
2		thanan, N. Suresh kumar and A. Vallavanraj, "Hill, 2 nd Edition, (2008).	Electronic Devices and	Circuits",Tata			
3	David A (2008).	Bell, "Electronic Devices and Circuits", Ox	xford University Press	, 5th Edition,			
REFER	RENCES:						
1	Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7 th Education, (2006).						
2	William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6 th Edition, 2002.						
3	J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2 nd Edition, 2008.						





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	II Semester									
Cou	rse code	Course Name	Hours/week			Hours/week			Credit	Maximum marks
220	X71 2 001	PHYSICS LABORATORY	L	T	P	C	100			
22P	Y12001	(Common to All Branches)	0	0	3	1.5	100			
		To impart knowledge on				1				
Obj	ective(s)	 To provide exposure to the students. 				experienc	ce on various			
		basic Applied physics practice								
		Upon Completion of the course, the st								
04	h (-)	The hands on exercises underg	one by	the stu	idents	will help	them to apply			
Out	tcome(s)	physics. Principles of optics and therms	al nhvei	ice to a	valuat	a anginaa	ring properties of			
		 Principles of optics and thermal physics to evaluate engineering properties of materials. 								
		LIST OF EXPER	IMEN'	TS						
1	a) Deter	mination of Wavelength, and particle size	ze usin	g Lasei	· ·					
1.	b) Deter	mination of acceptance angle in an optic	cal fibe	r.						
2.		ation of velocity of sound and compress	sibility	of liqu	id – U	Itrasonic i	interferometer.			
3.	`	ge – Thickness of a Wire.								
4.	Determin	ation of wavelength of mercury spectru	m – spo	ectrom	eter gi	rating.				
5.	Determin	ation of Young's modulus by Non unifo	orm ber	nding n	nethod	l.				
6.	Determin	ation of Band Gap of a semiconductor r	nateria	1.						
7.	Determin	ation of viscosity of liquid – Poiseuille"	's meth	od.						
8.		ation of Young's modulus by Uniform l	-	_	od.					
9.	Torsional	Pendulum – Determination of Rigidity	modul	us 10.						
10.	Spectrom	eter dispersive power of a prism.								
		Total hours to	o be tau	ıght		45 Pc	eriods			
REFE	ERENCE:									
1.	Physics L	aboratory Manual, Department of Physi	cs, Ma	hendra	Engir	neering Co	ollege, Namakkal.			
2.		on, BSc Practical Physics, 1st Edn. (200								
3.		snop and H. T. Flint, Advanced Practice								
4.		ash and Ramakrishna, A Text Book of I								
5.		ndelwal, A Laboratory Manual of Physi	ics for l	Underg	gradua	te Classes	, Vani			
	Publicatio	n House, New Delhi.								



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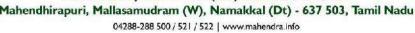


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Department		04288-288 500 / 521 / 522 www.	Progr)	1101			
		Code							
		II Semeste	er				Maximum		
Course code		Course Name	Ho	Hours/weel		Credit	marks		
		PROBLEM SOLVING	L	T	P	C			
22CS23001		TECHNIQUES LAB (Common to All Branches)	0	0	3	1.5	100		
		The student should be made to:							
		 Understand interfacing compo 	nents o	f PC N	Mother	board.			
		 Expertise in developing applic 	ations	using (Office	packages.			
Obj	ective(s)	 Formulate problems and imple 	ement a	lgorith	ıms us	ing RS too	ol.		
		Identify the interfacing compo	nents c	of PC.					
		 Apply Office packages for spe 	ecified a	applica	ation c	reation.			
Out	come(s)	 Obtain solutions for the real world problems using Raptor and Scratch tool. 							
Out	come(s)	 Develop programs using decision making statements, loops and functions. 							
		 Apply structures, unions and files using various types of statements for 							
		problem solving in C.							
		LIST OF EXPER	IMEN'	TS					
1.	Study an	d Identification of PC Motherboard and	l Its Int	erfacir	ng Con	ponents.			
2.		A bio-data Using MS Word With App And Send The Same To Recipients Using				And Tabl	e Formatting		
3.	Create bu	dget planning of your family with cell recel.	referen	cing, f	ormula	e, condition	onal formatting		
4.	Create a	Program flow to illustrate the use of Va	ariables	and C	Constan	ts using S	cratch Tool.		
5.	Construc	t flowchart to find the Factorial for a give	ven nur	nber U	Jsing R	aptor.			
6.		mark generation using decision stateme	nts.						
7.	Calculato	or using switch statement.							
8.	Prime nu	mber generation using looping.							
9.	Greatest	number using array (one dimensional).							
10.	Matrix m	ultiplication using array (two dimension	nal).						
11.	String fur	nctions.							
12.	Factorial	calculation and Fibonacci series using f	function	1.					
13.	Student n	nark sheet using structures.							
14.	Copy tex	t from one file to other File.		-					
		Total hours to	o be tai	ıght		30 Pc	eriods		



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Department		Mechatronics	Programme Code & Name			110	01 & MCT	
		II Semeste	r					
Cou	rse code	Course Name	Но	ours/w	eek	Credit	Maximum marks	
		COMPUTER AIDED DRAFTING	G L T		P	C		
22G	E24201	AND MODELING LABORATORY	0	0	3	1.5	100	
		To impart knowledge on						
Obj	ective(s)	 To develop skill to use softwar 	re to cr	eate 2D	and (3Dmodels.		
		Upon Completion of the course, the st	udents	will be	e able	to:		
Out	tcome(s)	Ability to use the software pace.	kers fo	r drafti	ing an	d modeling	-	
		 Ability to create 2D and 3D mo 	odels o	f Engir	neerin	g Compon	ents.	
LIST	OF EXPE	RIMENTS						
		capabilities of software for Draftin	_		_		-	
1.		relative, polar)-Creation of simple fig.	polar)-Creation of simple figures like polygon and general multi-line					
	figures.							
2.		of a Title Block with necessary text and						
3.		of curves like ellipse, parabola, hyperbo						
4.	Drawing dimension	of front view and top view of simple sing.	solids	like pr	ism, p	yramid, cy	ylinder and cone -	
5.		front view, top view and side view of ol Simple stool, Objects with hole and cur		from th	e give	n pictorial	views (eg.	
6.	Drawing	of a plan of residential building (Two be	ed rooi	ms, kito	chen, l	nall, etc.).		
7.	Drawing	of a simple steel truss.						
8.	Drawing	sectional views of prism, pyramid, cylir	nder an	d cone	•			
9.	Drawing	isometric projection of simple objects.						
10.	Creation model.	of 3-D models of simple objects and	obtain	ning 2-	D mu	lti-view dı	rawings from 3-D	
		Total hours to	be tai	ught		45 Pe	eriods	
LIST		PMENTS (for a batch of 30 students)						
1.		dware, with suitable graphics facility	-30 N					
2.		software for Drafting and Modeling.		0Licens	ses			
3.	Laser Prin	ter or Plotter to print /plot drawings	- 1No				^	





III SEMESTER



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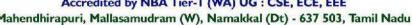
Regulation 2022

III Semester

		III Semester					
Sl. No.	Course code	Course Title	Category	L	T	P	• 6
		THEORY					
1	22MA12303	Partial Differential Equations & Numerical Methods	BS	3	1	0	4
2	22MT14301	Strength of Materials for Mechatronics	PC 3 1 0				4
3	22MT14302	Basics of Fluid Mechanics and Machinery	PC	3	0	0	3
4	22MT14303	Electrical Drives and Actuators	PC	3	0	0	3
5		Open Elective - 1	OE	3	0	0	3
6	22SH11006	Universal Human Values	HS	3	0	0	3
	1	PRACTICAL	'		'		
7	22MT24301	Strength of Materials Laboratory	PC	0	0	3	1.5
8	22MT24302	Fluid Mechanics and Machinery Laboratory	PC	0	0	3	1.5
9	22MT24303	Electrical Drives and Machines Laboratory	PC	0	0	3	1.5
		TOTAL		18	2	9	24.5



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Department	Mechatronics	Pro	ogram & Nai		1101 & MCT			
III Semester								
Course code	Course Name	Hours/week		Hours/week		Credit		ximum narks
22MA12303	PARTIAL DIFFERENTIAL EQUATIONS & NUMERICAL	L 3			_		100	
	METHODS		•		·			
	To enable the students to:							
	 Learn about the techniques to so 	olve pa	rtial di	fferent	tial equation	ons.		
Objective(s)	 Study the method of separation problems using Fourier series. 	on of	variabl	les and	d solving	bound	ary value	
	 Acquire the knowledge of the solution of algebraic and transcendental equations and study the methods to solve linear system of equations by direct and iterative methods. 							
	 Evaluate the derivatives from finite differences and evaluate single and double integrals by numerical integration methods. Gain the knowledge to solve ordinary differential equations by single step and multi - step methods. 							
							ingle step	
	At the end of the course, the students will be able to: • Formulate partial differential equations by eliminating arbitraryconstants and functions. • Classify the types of PDE of second and higher order with constant							
Outcome(s)	coefficients							
(2)	• Determine the solution of algebraic and transcendental equations and system of linear equations numerically.							
	 Acquire the knowledge of numerical differentiation and integration using finite differences. 							
	• Solve ordinary differential equ	ations	using 1	numeri	cal metho	ds.		
UNIT - I	PARTIAL DIFFERENTIAL EQUA	TION	S				(9+3)	
Formation of pararbitrary function	rtial differential equations by elimina ons-Formation of Lagrange's line ons of second and higher order with co	ting ar	bitrary	n-Hom			minating	
UNIT - II	APPLICATIONS OF PARTIAL DI				UATION	NS	(9+3)	

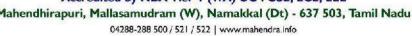
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) - Fourier series solutions in cartesian coordinates.

> Dr. T.JESUDAS, M.E., Ph.D Professor and Head Department of Mechatronics Mahendra Engineering College Mallasamudram, Namakkal



UNIT - IV

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UNIT - III NUMERICAL SCHEEMS OF SOLVING EQUATIONS

Education, Asia, New Delhi, 2006.

(9+3)

(9+3)

Solution of equation – Iteration method and Newton - Raphson method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method –Gauss Jacobi method and Gauss-Seidel method – matrix inversion by Gauss Jordon method.

NUMERICAL DIFFERENTIATION AND INTEGRATION

Differentiation using Newton's forward and backward interpolation formula -Numerical integration

by Trapezoidal and Simpson's 1/3 and 3/8 rules – Two and Three point Gaussian quadrature formulae – Double integrals using Trapezoidal and Simpsons's rules.						
	IT - V INITIAL VALUE PROBLEMS FOR ORDINE EQUATIONS	VARY DIFFERENTIAL (9+3)				
Single s	tep methods: Taylor series method - Euler's method and M	Modified Euler method for first order				
equation	n – Fourth order Runge – Kutta method for solving first of	order equations – Multistep method:				
Milne's	predictor and corrector methods.					
	Total hours to be taugh	(L:45+T:15): 60 Periods				
TEXT I	BOOKS:					
1	Veerarajan.T, "Transforms and Partial Differential Equations", First Edition, Tata McGrawHill, 2018.					
2.	Dr.P.Kandasamy, Dr.K.Thilagavathy and Dr.K.Gunav Volume – III",S.Chand & company Ltd. New Delhi, Rev	•				
REFER	RENCE:					
	N.P. Bali and Manish Goyal, , Transforms and Pa	rtial Differential Equations Laxmi				
1	Publications, 2010					
2	Erwin kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Wiley & Sons, 2016.					
3	Sankara Rao K, "Numerical Methods for Scientisits and Engineering", 3 rd Edition, Printice Hall of India Private Ltd, New Delhi, 2007.					
1	Gerald, C.F.and Wheatley, P.O., "Applied Numerical Analysis", 6 th Edition, Pears					

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Department	Mechatronics	Programme Code			110	01	
III Semester							
Course code	Course Name	Hours/week Credit			Maximum Marks		
22MT14301	STRENGTH OF MATERIALS	L 3	T	P 0	C	100	
 FOR MECHATRONICS 3 1 0 4 To understand the concepts of stress, strain, principal stresses and principal planes To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses. To determine stresses and deformation in circular shafts and helical spring due to torsion. To compute slopes and deflections in determinate beams by various methods. To study the stresses and deformations induced in thin and thick shells. 							
Outcome(s)	 At the end of the course the students would be able to Apply the concepts of stress and strain in simple and compound bars, and explain the importance of principal stresses and principal planes. Identify the load transferring mechanism in beams and calculate the stress distribution due to shearing force and bending moment. Apply basic equation of torsion in designing of shafts and helical springs Calculate slope and deflection in beams using different methods. Analyze thin and thick shells for applied pressures. 						
UNIT-I	STRESS STRAIN DEFORMATION	N OF S	SOLID	S		(9+3)	
Shear –Deformations constants –Volume Mohr's circle of		under nes – P	axial l	oad – al stres	Thermal ses and pr	stress – Elastic rincipal planes –	
UNIT-II	TRANSVERSE LOADING ON BEAM					, ,	
Beams – Types - Transverse loading on beams – Shear force and Bending moment in beams – Cantilever, Simply supported and over hanging beams. Theory of simple bending – Bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams– Shear stress distribution.							
UNIT-III	TORSION					(9+3)	
Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close- coiled helical springs—Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads.							

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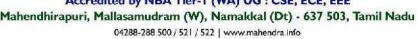
Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - Conjugate beam method for computation of slope and deflection of determinant beams. UNIT-V THIN CYLINDERS, SPHERES AND THICK CYLINDERS (9+3) Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders - Spherical shells subjected to internal pressure - Deformation in spherical shells - Thick cylinders - Lame's theory. Total hours to be taught 60 Periods TEXT BOOKS: 1 Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997. Beer F. P. and Johnston R," Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002. REFERENCE: Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 1981. Ryder G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.	UNIT-I	V	BEAM DEFLECTION	(9+3)					
determinant beams. UNIT-V THIN CYLINDERS, SPHERES AND THICK CYLINDERS (9+3) Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders - Spherical shells subjected to internal pressure - Deformation in spherical shells - Thick cylinders - Lame's theory. Total hours to be taught 60 Periods TEXT BOOKS: 1 Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997. 2 Beer F. P. and Johnston R," Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002. REFERENCE: 1 Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995. 2 Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 1981. 3 Ryder G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002. 4 Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.	Elastic o	Elastic curve – Governing differential equation - Double integration method - Macaulay's method -							
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Edition, 2002. REFERENCE: Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 1981. Ryder G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.	1	Popov 1	E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delh	i, 1997.					
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 McGraw-Hill Book Co, New York, 1995. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 1981. Ryder G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004. 	REFER	ENCE:							
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 Ryder G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004. 	1	McGrav	w-Hill Book Co, New York, 1995.						
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	3	Ryder (G.H, "Strength of Materials, Macmillan India Ltd"., Third Edition, 2002.						
	4	Ray Hu	lse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Book	s, 2004.					
5 Singh D.K "Mechanics of Solids" Pearson Education 2002.	5								
			100						



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Department	Mechatronics	Programme Code				1101				
	III Sem	ester								
Course code	Course Name	Hours/week		ours/week Credi		Maximum Marks				
22MT14302	BASICS OF FLUID	L	T	P	C	100				
	MECHANICS AND MACHINERY	3	0	0	3					
	To impart knowledge on the properties of fluid and fluid statics principles									
	• To calculate the rate of flow	and ener	gy los	ses in i	flow throu	gh pipes				
Objective (s)	 To emphasize the concepts dimensional analysis 	of bou	ındary	layer	theory a	nd the importance of				
	 To educate the working prince 	iples an	d perfo	rmanc	e analysis	of fluid pumps.				
	 To provide knowledge on hydraulic turbines 	the wor	rking	princij	ple and p	erformance curves of				
	At the end of the course, the students									
	1. Explain the fluid properties	and the	e press	sure m	easureme	nt using fundamental				
	laws of fluid mechanics									
Outcome(s)	2. Analyze the volume rate of fl					• • •				
Outcome(s)	3. Apply the concept of bounda the fluid structures	ry layer,	Dime	nsiona	l analysis	and Modal analysis on				
	4. Select a suitable pump fo	_	en ap	plicati	on and e	valuate the operating				
	characteristics of Hydraulic p	-								
	5. Choose a suitable turbine		ven aj	plicat	ion and	evaluate the operating				
TINITO T	characteristics of Hydraulic t FLUID PROPERTIES AND FLO		D A CT	rrbic	TICS	(0)				
UNIT-I						(9)				
	n, distinction between solid and fluid – e Measurements - Buoyancy and flo									
	tion of continuity equation, energy equ	ation ar	d mon	nentun	n equation					
UNIT-II	FLOW THROUGH PIPES					(9)				
	nent - Laminar flow through circular cond nd minor losses -Hydraulic and energy gra		•		•	•				
UNIT-III	FLUID FLOW OVER BODIES A	ND DIN	IENS I	(ONA)	L ANALY	YSIS (9)				
	concepts-Types of boundary layer t ysis -Methods of dimensional analysis				-					
	nensionless parameters-Application of					i Similitude Types				
UNIT-IV	TURBINES			1	-	(9)				
Classification of	turbines heads and efficiencies veloci	ty triang	gles. A	xial, r	adial and	mixed flow turbines.				
Pelton wheel, Fra	Pelton wheel, Francis turbine and Kaplan turbines- working principles. Work done by water on the runner draft tube. Specific speed unit quantities performance curves for turbines.									
draft tube. Specific speed unit quantities performance curves for turbines. Professor and Head Professor and Head										

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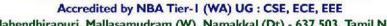


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UNIT-V	PUMPS	(9)				
	quation - Theory of roto-dynamic machines-Centrifugal pumps working principle.					
_	work done by the impeller - performance curves - Reciprocating pump- working	principle Rotary				
pumps –cl	lassification					
	Total hours to be taught 45 Period	ods				
TEXT BO	OOKS:					
1	Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (Delhi.	P) Ltd., New				
2	Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1983.					
REFERE	NCE:					
1	Kumar. K.L., Engineering Fluid Mechanics (VII Ed.) Eurasia Publishing House Delhi, 1995.	e (P) Ltd., New				
Ramamritham. S, Fluid Mechanics, Hydraulics and Fluid Machines, Dhanpat Rai & Sons, Delhi, 1988.						
3	Rathakrishnan. E, Fluid Mechanics, Prentice Hall of India (II Ed.), 2007.					
4						
5	Som, S.K., and Biswas, G., Introduction to Fluid Mechanics and Fluid Machin McGraw-Hill, 2004.	es, Tata				



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Department of Mechatronics

Mahendra Engineering College

Mallasamudram, Namakkal

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Department	04288-288 500 / 521 / 522 Mechatronics	Programme Code 1101			1101			
III Semester								
Course code	Course Name	Hours/	kimum marks					
22MT14303	ELECTRICAL DRIVES AND ACTUATORS	L 3	T 0	P 0	C 3	100		
 To familiarize a relay and power semiconductor devices. To get a knowledge on drive characteristics. To obtain the knowledge on DC motors and drives. To obtain the knowledge on AC motors and drives. 								
 To obtain the knowledge on Stepper and Servo motor. At the end of the course, the student able to: Recognize the principles and working of relays, drives and motors. Explain the working and characteristics of various drives and motors. Outcomes Apply the solid state switching circuits to operate various types of Motors and Drivers Interpret the performance of Motors and Drives. Illustrate the Motors and Drivers for given applications 								
UNIT-I	RELAY AND POWER SEMI-CO	ONDUCTO	OR DE	VICES		(9)		
MOSFET, IGB	ning Devices – Relay and Types, Swi T and IGCT-: SCR, MOSFET and Driver and snubber circuits.	_						
UNIT-II	DRIVE CHARACTERISTICS					(9)		
	- Equations governing motor load dy eleration, deceleration, torque, and Dis		•		•	-		
UNIT-III	DC MOTORS AND DRIVES		•			(8)		
	or - Types of PMDC & BLDC moracteristics and control – Drives- Holications.							
UNIT-IV AC MOTORS AND DRIVES Introduction – Induction motor drives – Speed control of 3-phase induction motor – Stator voltage control – Stator frequency control – Stator voltage and frequency control – Stator current control – Static rotor resistance control – Slip power recovery control.								
UNIT-V	STEPPER AND SERVO MOTOI					(10)		
Stepper Motor: Classifications- Construction and Principle of Operation – Modes of Excitation Drive System-Logic Sequencer - Applications. Servo Mechanism – DC Servo motor-AC Servo motor-Applications. Professor and Head Professor and Head Professor and Head								



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Total hours to be taught



45 Periods

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TEX	T BOOKS
1	Bimbhra B.S., "Power Electronics", 5th Edition, Kanna Publishers, New Delhi, 2012.
2	Mehta V.K. & Rohit Mehta, "Principles of Electrical Machines", 2nd Edition, S.Chand& Co. Ltd., New Delhi, 2016.
REF	ERENCE
1	Gobal K. Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosal Publishing House, New Delhi, 2001.
2	Theraja B.L. & Theraja A.K., "A Text Book of Electrical Technology", 2nd Edition, S.Chand& Co. Ltd., New Delhi, 2012.
3	Singh M.D. &Kanchandhani K.B., "Power Electronics", McGraw Hill, New Delhi, 2007





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Course Code	Course Name	Hours/Week			Credit	Maximum
22SH11006	006 UNIVERSAL HUMAN VALUES	L	T	P	C	Marks
2251111000		2	1	0	3	100

(Mandatory Credit Course to All UG Programmes to be offered in III / IV Semester)

Pre-requisites: Universal Human Values 1 (Induction Programme) (desirable)

The foundation course "H-102 Universal Human Values: "Understanding Harmony" may be covered in III or IV semester. This course discusses the role of human beings in their family. It also touches issues related to their role in the society and the nature. During the Induction Program, students would get an initial exposure to human values through Universal Human Values 1. This exposure is to be augmented by this compulsory full semester foundation course. The Course has 5 Modules (5 Units): 30 Lectures and 15 Practice sessions (Tutorials).

1. COURSE OBJECTIVES:

The objectives of the course are:

- (i). Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- (ii). Understanding (or developing clarity) the harmony in the human being, family, society and nature/existence
- (iii). Strengthening of self-reflection for harmonious relationship in family, society
- (iv). Development of commitment and courage to act as human being in ensuring harmony in nature for co-existence.
- (v). Development of holistic principles of harmony and professional ethics for natural acceptance of human values and observe ethical human conduct.

2. COURSE OUTCOMES:

Upon completion of the Course the Learner will be able to:

- Distinguish between values and skills, and highlight the need for Universal Human Values.
- > Describe the need for Harmony and distinguish between happiness and accumulation of physical facilities, etc.
- ➤ Relate the value of harmonious relationship in family, society based on trust and respect for happiness and prosperity in their life and profession.
- > Outline the role of a human being in ensuring harmony in nature for co-existence.
- ➤ Apply the holistic principles of Harmony and Professional Ethics for natural acceptance of human values and observe Ethical Human Conduct.

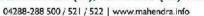
Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- L 1. Purpose and motivation for the course, recapitulation from Universal Human Values-I (Induction Programme).
- L 2. Self-Exploration—what is it? Its content and process; 'Natural Acceptance' and Experiential Validation-as the process for self-exploration.
- L 3. Continuous Happiness and Prosperity A look at basic Human Aspirations.
- L 4. Right understanding, Relationship and Physical Facility the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- L 5. Understanding Happiness and Prosperity correctly A critical appraisal of the current scenario.
- L 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.



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3 Practice sessions (T1 to T3) - To discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

- L 7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- L 8. Understanding the needs of Self ('I') and 'Body'- happiness and physical facility
- L 9. Understanding the Body as an instrument of 'I'(I being the doer, seer and enjoyer)
- L 10.Understanding the characteristics and activities of 'I' and harmony in 'I'
- L 11.Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- L 12.Programs to ensure Sanyam and Health.
- 3 Practice sessions (T4 to T6) To discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society - Harmony in Human-Human Relationship

- L 13. Understanding values in human-human relationship; meaning of Justice (Nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- L 14. Understanding the meaning of Trust; Difference between intention and competence.
- L 15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- L 16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.
- L 17. Visualizing a universal harmonious order in Society-Undivided Society, Universal Order-from family to world family.
- 3 Practice sessions (T7 to T9): Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Discuss Gratitude as a universal value in relationships, scenarios. Elicit examples from students' lives.

Module4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- L 18. Understanding the harmony in the Nature.
- L 19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature.
- L 20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space.
- L 21. Holistic perception of harmony at all levels of existence.
- 2 Practice sessions (T10 to T11): Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc. T. JESUDAS, M.E., Ph.D



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Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- L 22. Natural acceptance of human values.
- L 23. Definitiveness of Ethical Human Conduct.
- L 24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- L 25. Competence in professional ethics: (a). Ability to utilize the professional competence for augmenting universal human order (b). Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, (c). Ability to identify and develop appropriate technologies and management patterns for above production systems.
- L 26. Case studies of typical holistic technologies, management models and production systems.
- L 27. Strategy for transition from the present state to Universal Human Order: (a). At the level of individual: as socially and ecologically responsible engineers, technologists and managers (b). At the level of society: as mutually enriching institutions and organizations.
- L 28. Definition of Morals, Values and Ethics Integrity Work ethic Service learning Civic virtue Respect for others Living peacefully.
- L 29. Importance of Caring Sharing Honesty Courage Valuing time Cooperation Commitment Empathy Self-confidence Character Spirituality.
- L 30. Introduction to Yoga and meditation for professional excellence and stress management. *Sum up*.
- 4 Practice sessions (T12 to T15) Include Practice Exercises and Case Studies which will be taken up in Practice (Tutorial) Sessions.
- eg. To discuss the conduct as an Engineer or Scientist, etc.

TOTAL = 45 Hours

3. READINGS:

3.1 Textbook

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

3.2 Reference Books

- 1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
- 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- 3. The Story of My Experiments with Truth -by Mohandas Karamchand Gandhi
- 4. Small is Beautiful E. F Schumacher.
- 5. Slow is Beautiful Cecile Andrews.
- 6. Economy of Permanence J C Kumarappa.
- 7. Bharat Mein Angreji Raj Pandit Sunderlal.
- 8. Rediscovering India by Dharampal.
- 9. Hind Swaraj or Indian Home Rule by Mohandas K. Gandhi.
- 10. India Wins Freedom Maulana Abdul Kalam Azad.
- 11. Vivekananda Romain Rolland (English).
- 12. Mika Martin and Roland Scinger, 'Ethics in Engineering', Pearson Education/Prentice Hall, New York 1996.



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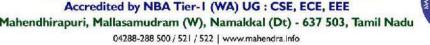




De	partment	Mechatronics	Programme Code			110	1
III Semester							
	Course		Ho	urs/V	Veek	Credit	Maximum
	Code	Course Name	L	T	P	C	Marks
22MT24301 STRENGTH OF MATERIALS LABORATORY 0 0 3 1.5						100	
	To study the mechanical properties of materials when subjected to tension. To study the mechanical properties of materials when subjected to torsion. To study the mechanical properties of hardness materials. To study the mechanical properties of materials when subjected to compression load. To study the mechanical properties of materials when the materials gets deformed. The students will be Ability to perform Tension test. Ability to perform Torsion test. Ability to perform Hardness test. Ability to perform Compression test.						
		5. Ability to perform Deforma LIST OF EXPE			l mater	rials.	
1.	Tension tes	t on a mild steel rod					
2.	Double she	ar test on Mild steel and Aluminum ro	ds				
3.	Torsion tes	t on mild steel rod					
4.	Impact test	on metal specimen					
5.	Hardness te	est on metals - Brinnell and Rockwell	Hardness N	umbe	r		
6.	Hardness te	est on wood - universal testing machin	e				
7.	Deflection	test on cantilever beams					
8.	Deflection	test on wooden beams					
9.	Compression	on test on helical springs				-6	()
	Total hours to be taught 30 Periods						



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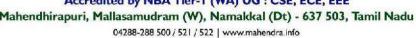




ъ.	04288-288 500 / 521 / 522 www.mahendra.into									
De	partment	Mechatronics	Code			Code			110	1
III Semester										
	Course		Ho	urs/W	/eek	Credit	Maximum			
	Code	Course Name	L	Т	P	C	Marks			
22	MT24302	FLUID MECHANICS AND MACHINERY LABORATORY	0	0 0 3			0 0 3		1.5	100
O	 To verify the principles studied in Fluid Mechanics theory by performing experiments in lab. To study and understand the importance of various types of flow in pumps. To study and understand the importance of dimensional analysis. To study and analyze the performance of pumps. To study and analyze the performance of turbines. 									
C	The students should be able to 1. Use the measurement equipments for flow measurement. 2. Perform test on flow measurement devices. 3. Can analyze and calculate major and minor losses associated with pipe flow in piping. 4. Perform test on different types of fluid pumps. 5. Perform test on different types of fluid turbines.									
		LIST OF EXPE	RIMENTS	5						
1.	Determinat	ion of the Coefficient of discharge of g	given Orific	e met	er.					
2.	Determinat	ion of the Coefficient of discharge of g	given Ventu	ıri me	ter.					
3.	Determinat	ion of minor losses in pipes.								
4.	Determinat	tion of friction factor for a given set of	pipes.							
5.	Bernoulli's	Theorem – Verification								
6.	Conducting	g experiments and drawing the characte	eristic curve	es of c	entrif	ugal pum _l	o.			
7.	Conducting	g experiments and drawing the character	eristic curve	es of r	ecipro	cating pu	mp.			
8.	Conducting	g experiments and drawing the character	eristic curve	es of C	Gear p	ump.				
9.	Conducting	g experiments and drawing the characte	eristic curve	es of F	Pelton	wheel.				
10.	Conducting	g experiments and drawing the characte	ristics curv	es of	Franc	is turbine.	00			
Total hours to be taught 30 Periods										



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Department	Mechatronics	Programme Code				110	1
	III Semester	•					
Course		Ho	urs/W	/eek	Credit	Maximum	
Code	Course Name	L	T	P	С	marks	
22MT24303	ELECTRICAL MACHINES & DRIVES LABORATORY	0	0	3	1.5	100	
Objective(s)	• To impart knowledge on Performance of the fundamental control practice associated with AC and DC machines (starting, reversing, braking, plugging etc.) using power electronics.						
	 To impart industry oriented learn 	ing.					
	 To evaluate the use of compute classes of machines and their phy 		•			ew the major	
Outcome(s) 1. Illustrate the basic working of AC, DC motor, stepper motor, serve and synchronous motor using power electronic drive.						, servo motor	
2. Demonstrate the control of AC, DC motor, synchronous motor using power electronic dri					motor, ser	vo motor and	
	3. Analyze the performance of AC, synchronous motor using power of				motor, ser	vo motor and	
	LIST OF EXPER	IMENTS	;				
1. Load test	on DC Motor.						
2. Load test	on 3 Phase Induction Motor.						
3. Load test	on 3 Phase Synchronous Motor.						
4. Rheostat	based Speed control of motors (AC and D	C).					
5. Switching	g circuits of MOSFET, IGBT, SCR and TE	RAIC.					
6. Gate puls	ation generation using PWM signals.						
7. Speed cor	ntrol of DC motor using Power Electronic	Drive.					
8. Position a	and direction control DC servomotor using	Power E	lectro	nic D	rive.		
9. Position,	direction and speed control of BLDC and	PMDC m	otors	using	Power Ele	ectronic Driv	
10. Position,	Direction and speed control of stepper Mo	tor.					
11. AC servo	motor position, direction and speed contro	l using P	ower]	Electr	onic Drive	e	
,	То	tal hours	to be	taught	30 Peri	iods	

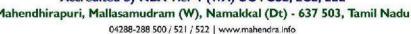




IV SEMESTER



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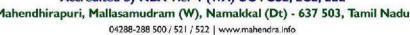




Regulation 2022 IV Semester Sl. Course code Category \mathbf{L} \mathbf{T} P \mathbf{C} **Course Title** No. **THEORY** 22MT14401 PC 0 1 Kinematics and Dynamics of Machinery 3 1 4 2 22MT14402 PC 3 0 0 3 Manufacturing Technology 3 22MT14403 Digital Principles and System Design PC 3 0 0 3 Professional Elective – 1(Product Design and 4 PE 3 0 3 22MT15008 0 Development) 5 Open Elective – 2 (Basics of Mechanical Design) OE 3 0 0 3 22AE15405 Open Elective – 3 (Numerical, Logical and Visual 22MA12401 3 3 6 OE 0 0 Reasoning Skills) 7 22CY11001 **Environmental Science** BS 3 PRACTICAL PC 8 22MT24401 **Dynamics Laboratory** 0 0 3 1.5 9 22MT24402 Manufacturing Technology Laboratory PC 0 0 3 1.5 22EN60001 **Professional Communication Skills** 2 10 EEC 0 1 1 TOTAL 2 7 21 24



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Department	Mechatronics Engineering	Programme Code					1101
	IV Semester						
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks	
22MT14401	KINEMATICS AND DYNAMICS	L 3	T	P 0	C	100	
Objective(s)	 To study the basic concepts of To Analyzing the force-moti external forces and analyzing To Analyzing the undesiral prescribed motions in mediundesirable vibrations. 	To introduce the mechanisms for control, focusing on governors and					
Outcome(s)	The students will be able to 1. Discuss the basics of mechani 2. Solve problems on gears and g 3. Calculate static and dynamic 4. Calculate the balancing mas rotating masses. Computing vibration and damping coeffice 5. Describe and analyze governimpact of gyroscopic forces of	gear transfer forces are ses are the fient.	of med d their frequent	r locat ency o oscopi	cions of record free v	ibration, forced and evaluate the	
UNIT-I	BASICS OF MECHANISMS (9+3)						

Basic concepts of Link, Kinematic pair, Kinematic chain, Mechanism, Machine, Degree of Freedom, Kutzbach and Gruebler's criterion and Grashoff's law - Kinematic Inversions of four bar chain and slider crank chain - Mechanical Advantage - Transmission angle. kinematics analysis in simple mechanisms – velocity and acceleration of single slider crank mechanism.

UNIT-II GEARS AND GEAR TRAINS

(9+3)

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.



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UNIT-III DYNAMIC FORCE ANALYSIS OF MECHANISMS (9+3)

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members

UNIT-IV BALANCING AND VIBRATION (9+3)

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation.

UNIT-V MECHANISM FOR CONTROL (9+3)

Governors – Types – Centrifugal governors – Gravity controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves. Gyroscopic – Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.

Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.							
	Total hours to be taught	60 Periods					
TEXT	T BOOK:						
1	Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, 2017.						
2	2 Rattan SS, "Theory of Machines", 5th Edition, Tata McGraw-Hill, 2019.						
REFE	ERENCE:						
1	Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publis	shers and Distributors, 2010.					
2	Cleghorn. W. L, "Mechanisms of Machines", Oxford University	y Press, 2014.					
3	Benson H. Tongue, "Principles of Vibrations", Oxford University	ty Press, 2nd Edition, 2012.					
4	Robert L. Norton, "Kinematics and Dynamics of Machinery", T	ata McGraw-Hill, 2017.					
5	Wilson and Sadler, Kinematics and Dynamics of Machinery, Pe	earson, 2008.					
6	Khurmi RS, Gupta JK "Theory of Machines", S Chand Publicat	ions, 2020.					



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Department	Mechatronics Engineering	Programme Code		1101				
	IV Semester							
Course code	Course Name	Hours/week Cre			dit M	aximum Marks		
22MT14402	MANUFACTURING	L	L T		C	C 100		
	TECHNOLOGY	3	3 0		3			
Objective(s)	 To help acquire knowledge about the behavior and manufacturing properties of all engineering materials and basic concepts of foundry and casting processes. To teach various methods of welding processes. To understand advanced metal forming processes in detail. To learn the concepts on basic conventional machines. To impart knowledge on Non-conventional machining processes. 							
Outcome(s)	 Explain different metal casting processes, associated defects, merits and demerits. Compare different metal joining processes. Explain the theories of advanced metal forming. Explain various primary machining processes Appraise the abrasive machining process based on the surface finish requirements. 							
UNIT-I	CASTING PROCESSES					(9)		

Introduction to casting, Patterns, Types, Pattern Materials, allowances - Moulding - types- Moulding sand, Requirements of moulding sands, Riser Cores & Core making. Special Casting Process, Die casting, Centrifugal Casting. Casting Defects. Melting furnaces Cupola and Induction furnaces.

UNIT-II METAL JOINING PROCESSES

(9)

Classifications - Welding equipment's, power requirement - Electrode Types - Specification, Gas welding - Types, Arc welding, TIG, MIG, Atomic Hydrogen, Co2 welding, Submerged Arc welding. Special welding-Laser, Electron Beam, Plasma Arc, Ultrasonic, Friction welding, Welding Defects - welding inspection and testing, Soldering, Brazing.

UNIT-III ADVANCED FORMING PROCESSES

(9)

Introduction to forming process. Elastic & plastic deformation, yield criteria. Hot working and cold working of metals. Electro-magnetic forming, Explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming.



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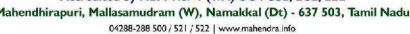
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Į	U NIT-IV	MATERIAL REMOVAL PROCESS	(9)				
and opera	Lathes-Introduction, Specification, types, Mechanism and attachments for various operations, Work and tool holding devices. Drilling machine-Specification-Types-Accessories- Feed mechanism-operations. Twist drill nomenclature. Generation of plain surfaces – shaping, planning, broaching: types, operations and mechanism.						
1	UNIT-V	NON-CONVENTIONAL MACHINING PROCESSES	(9)				
electi Ultra	Need for Unconventional processes – Electrical discharge machining (EDM) – Dielectric fluid – electrode – wire EDM –Electrochemical Machining (ECM) –Electrochemical Grinding (ECG), Ultrasonic Machining (USM) – Abrasive Jet Machining (AJM) – Laser Beam Machining (LBM) – Plasma Arc Machining (PAM).						
	Total hours to be taught 45 Periods						
TEX	TEXT BOOKS:						
1	Hajra Choudhury, S.K., and Haqira Choudhury, A.K., "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers Private Limited, Mumbai.						
2	2 Sharma P.C. A Textbook of Production Technology, S. Chand and Co., Ltd.						
REF	REFERENCE:						
1 Kalpakjian, s., "Manufacturing Engineering and Technology", Pearson education India, 4 edition, 2001 (ISBN 8178081571).							
2	Paul Degarma E, Black J.T. and Ronald A. Kosher, "Materials and Processes in Manufacturing" Eighth edition, Prentice – Hall of India, 1997.						
		Denjager	or and Head of Mechatronics				

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Department	Mechatronics Engineering	Programme Code		1101			
IV Semester							
Course code	Course Name	H	Hours/week			Maximum marks	
223 4751 4402	DIGITAL PRINCIPLES AND	L	T	P	C	100	
22MT14403	SYSTEM DESIGN	3	0	0	3	100	
Objective(s)	 To learn about the basics of digital logic circuits using logic gates. To impart knowledge on solving combinational circuits using logic gates. To impart knowledge on solving sequential circuits using flip flops. To understand the working principle of various memory devices and programmable logic devices. To design and construct combinational and sequential circuits. 						
Outcome(s)	 On the successful completion of the course, students will be able to Explain the concept of Boolean algebra and logic gates. Build the combinational circuits using logic gates. Contrast and debug the sequential circuit elements and its conversions. Interpret the types of memories with their operations and programmable logic devices. Develop the synchronous and Asynchronous sequential circuits using flip flops. 						
UNIT-I	DIGITAL FUNDAMENTALS					(9)	

Number Systems — Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes — Binary, BCD, Excess 3, Gray, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

UNIT-II COMBINATIONAL CIRCUIT DESIGN

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder — Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT-III SEQUENTIAL CIRCUITS DESIGN (9)

Latches, Flip-flops - SR, JK, D, T, and Master-Slave - Characteristic table and equation Application table - Edge triggering - Level Triggering - Asynchronous Ripple or serial counter - Asynchronous Up/Down counter - Synchronous counters - Synchronous Up/Down counters - Design of Synchronous counters: Modulo-n counter, Registers - Shift register counters.

Professor and Head

Department of Mechatronics
Mahendra Engineering College
Mallasamudram, Namakkal

(9)



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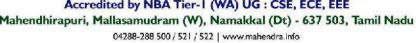
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UNIT-IV	MEMORY DEVICES (9)					
Classification of	Classification of memories – ROM AND RAM -Programmable Logic Devices – Programmable					
Logic Array (PL	A) - Programmable Array Logic (PAL) - Field 1	Programmable Gate Arra	ays			
(FPGA) -Implem	(FPGA) -Implementation of combinational logic circuits using ROM, PLA, PAL.					
UNIT-V	SYNCHRONOUS AND ASYNCHRONOUS SI CIRCUITS	EQUENTIAL	(9)			
Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic						
State Machine – Analysis of Synchronous Sequential Circuits.						
Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits –						
Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard						
Free Switching circuits.						
Total hours to be taught 45 Periods						

TEXT BOOK:			
1	M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 /		
1	Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.		
REFE	ERENCE:		
1	John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008.		
2	John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.		
3	Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.		
	Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6 th		
4	Edition, TMH, 2006.		
5	Donald D.Givone, "Digital Principles and Design", TMH, 2003.		
6	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Bearson Education Inc, 2011.		



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COURSE CODE	COURSE NAME	н	HOURS/WEEK		CREDIT	MAXIMUM MARKS
22 A E15405	BASICS OF	L	T	P	С	
22AE15405	MECHANICAL DESIGN	3	0	0	3	100
	> To the basics of Design	for M	1echa	nical com	ponents, she	et metal piping and
Objective	Valves					
	After completing the course the students: To Analysis the Engineering Drawing from various views.					
Outcome(s)	> To apply the GD &T in I	Engir	neerii	ng Drawing	gs	
	> To Familiarize the basics	proc	ess o	f Automot	ive Industry	
	➤ Gain knowledge about p	ipe a	nd va	lves desig	n	
	➤ Have the necessary under	_		_		als and their uses
UNIT I	ENGINEERING GRAPHIC					
	entation-Projection Basics, First					()
	ional Projections -Isometric Pro					
UNIT II	GEOMETRIC DIMENSION					(12)
GD&T-Basic Terr	ninology- GD&T Framework-S	ize T	olera	inces- Dat	ums- Positio	n- Orientation (Axis
	erial Modifiers- Surface Profile-					
Derived Element						
UNIT-III	AUTOMOTIVE INDUSTR	Y-PI	LAST	TIC AND	SHEET ME	TAL (9)
Product Life Cy	cle-Design Life Cycle-Types	of	plast	cs (Theri	noset Plasti	cs, Thermoplastic)-
•	ic Materials-Manufacturing Pr		-			-
	_		-		_	
materials-Design Flexibility-Precision and Accuracy-Types Of Sheet Metals-Sheet Metal Fabrication Techniques-Sheet Metal Cutting Techniques-Sheet Metal Forming Techniques-Challenges-						
Applications Of Sheet Metal Fabrication Parts In The Automotive IndustryIntroduction to Vehicle						
	tion System (EDS) - wiring har				=	
design.						
UNIT-IV	PIPE AND VALVES DESIG	GN				(9)
Piping And Abou	it Oil And Gas-Pipe Fitting-Fl	ange	Bas	ics-Valve	Basics-Pipe	Drafting- Codes &
Standards-Piping Fabrication-Introduction To Frp Pipes-Piping Sometrics, Symbole, Codes,						
Drawings.						
UNIT-V	ENGINEERING MATERIA	ALS				(9)
	erials classification-Metals, Po	•				
Materials, Electronic Materials, Smart Materials-Mechanical Properties of Materials-Elastic and						
Plastic deformation Graphical representation-Hardness-Stifness-toughness-wear-Fatique-Creep-Iron-						
carbon phase diag	ram-Tool and die steels.	rı	7-4-1	h 4. 1	h o 4ou -1-4	() (A5 Declarate
		1	otal	hours to l	be taught /	V45 Periods



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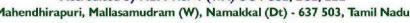


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TEX	T BOOKS:
1.	Kaushik Kumar/ Roy, Apurba Kumar & Ranjan, Chikesh "Engineering Graphics & Design"
	2001.
2.	Georg Henzold "Geometrical Dimensioning and Tolerancing for Design" 2006.
3.	Joseph P. Greene "Automotive Plastics and Composites: Materials and Processing" 2021.
4.	Karan Sotoodeh "A Practical Guide to Piping and Valves for the Oil and Gas" 2021.
REFI	ERENCE:
1.	A. M. Chandra, Satish Chandra Engineering Graphics 2003.
2.	Callister, William D., "Materials Science and Engineering: An Introduction," 9th Edition.



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	IV SEMESTER (For No.	n Circ	cuit B	ranches)							
COURSE CODE	COURSE NAME	HOURS/WEEK		HOURS/WEEK		HOURS/WEE		COURSE NAME HOURS/WEEK		CREDIT		MAXIMUM MARKS
	ENVIRONMENTAL SCIENCE	L	T	P	C							
22CY11001	AND ENGINEERING	3	0	0	0		100					
Objectives	 To make the students familiar with: The importance of Ecosystem and Natural resources. The basic concepts of biodiversity and emphasize on the biodiversity of India and its conservation. The causes, effects and prevention measures of environmental Pollution. The influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection. The effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and 											
At the end of the course the student will be able to Explain basic knowledge about the importance of environment, ecosystem and Natural resources. Classify the biodiversity and measure the variety of animals, plants and microbial species. Identify the awareness about the different types of Pollution and know about control measures. Organize the environmental impacts related to the society through WHO. Explore the awareness about population explosion, human welfare and role of information technology in environment.												
UNIT-I	ENVIRONMENT, ECOSYSTEM AN						(12)					
Definition, scope	e and importance of environment – Need for	or pub	nc aw	areness -	- Concept of	an ecc	osystem –					

Definition, scope and importance of environment – Need for public awareness – Concept of an ecosystem – Structure and Function of an ecosystem – Energy flow in the ecosystem – Ecological succession – food chains, food webs and ecological pyramids –Natural resources –Types and associated problems (Forest, Water, Food, Mineral and Energy resources).

UNIT-II BIODIVERSITY & CONSERVATION

(6)

Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – India as a mega- diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity – Field visit to local area.

UNIT-III ENVIRONMENTAL POLLUTION

(9)

Definition – causes, effects and control measures of: (a)Air, (b)Water, (c)Soil, (d)Noise, (c)Thermal pollution – solid waste management: causes, effects and control measures of municipal solid wastes and landslides – role of an individual in prevention of pollution — pollution case studies (vizage)



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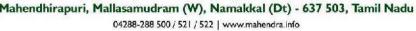
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gas le	eakage) – Fie	eld visit to local polluted area.				
Ţ	UNIT-IV	SOCIAL ISSUES AND THE ENVIRONMENT		(9)		
From	n unsustainab	le to sustainable development – water conservation strategy – Feature	of LARR	Act - Rights of		
a pro	perty holder	- role of non - governmental organizations- environmental ethics: Iss	ues and pos	ssible solutions		
– clir	mate change,	global warming, acid rain, ozone layer depletion, nuclear accidents a	nd holocau	st, case studies		
(Glol	bal warming)	-Waste land reclamation - consumerism and waste products - enviro	nment prot	tection act.		
	UNIT-V	HUMAN POPULATION AND THE ENVIRONMENT	•	(9)		
Defin	nition – Pop	ulation growth - variation among nations - population explosion -	family wel	lfare program -		
wom	en and child	welfare - environment and human health - human rights - value	education -	– HIV/AIDS –		
role	of information	on technology in environment and human health.				
			45	5 Periods		
TEX	TBOOKS					
1.	Gilbert M. Education,	Masters, "Introduction to Environmental Engineering and Science" 2023.	, 3 rd Editio	on, Pearson		
2.	Benny Jose	ph, "Environmental Science and Engineering", Tata McGraw-Hill, Ne	w Delhi, 20	017.		
3.		krishnan, "Environmental Science and Engineering", Sri Krishna Hi-taennai, 2014.	ech Publish	ning Company		
4.		ushik, C. P. Kaushik "Perspectives in Environmental Studies", 7 th I Publishers, 2021.	Edition, NI	EW AGE		
REF	ERENCE					
1.	R.K.Trived and II, Envi	i, "Handbook of Environmental Laws, Rules, Guidelines, Compliand ro Media.	ces and Sta	ındards", Vol. I		
2.	2. Rajagopalan, R, "Environmental Studies – From Crisisto Cure", Oxford University Press (2015).					
3.	Dharmendr	a S. Sengar, "Environmental law", Prentice hall of India PVT LTD, No	ew Delhi, 2	2007.		





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De	epartment	nent Mechatronics Programme Code					1101
		IV Semeste	er			1	
	Course		Hou	ırs/W	eek	Credit	Maximum
	Code	Course Name	L	T P		C	Marks
22	MT24401	DYNAMICS LABORATORY	0	0	3	1.5	100
Ol	 To supplement the principles learnt in Dynamics of Machinery to understate how certain measuring devices are used for dynamic testing. To study the inertia effect of components. To study the principles in mechanisms used for speed control and stability control. To understand the effect of Dynamics of undesirable vibrations and to understand the effect of damping. To study the undesirable effects of unbalances resulting from prescribed motions in mechanism. 						
O	utcome(s)	 At the end of the course, the students v Explain gear parameters, kinemat equipments. Determine mass moment of inerti Determine the gyroscopic effect a Determine the damping coefficient shafts. 	a of mechand govern nt, torsiona	hanisi anical or eff Il freq	eleme	nt, natura l range se	l frequency. nsitivity.
		LIST OF EXPER	RIMENTS				
1.		gear parameters. nental study of velocity ratios of Epicyc	lic gear tra	in.			
2.		s of Four Bar Mechanism.					
3.	Kinematics	s of Slider Crank Mechanism.					
4.	Determinat	tion of Mass moment of inertia of conne	cting rod.				
5.	Motorized	gyroscope – Study of gyroscopic effect	and couple	·			
6.	Governor -	Determination of range sensitivity, effort	ort etc., for	Proel	Gove	ernor.	
7.	verification	gree of freedom Spring Mass System of Laws of springs – Damping coeffici	ent determ	inatio	n.		Frequency and
8.	Transverse	vibration of Free-Free beam – with and	without co	oncen	trated	masses.	
9.	Vibration o	of Equivalent Spring mass system – und	amped and	damp	ed vil	oration.	
10.	Whirling o	f shafts – Determination of critical speed	ds of shafts	with	conce	ntrated lo	ads.
11.	Balancing	of rotating masses.				M	No.
		Т	otal hours	to be	taught	30 Peri	ods

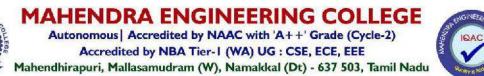


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De	epartment	Mechatronics	Programme Code 1101			1101	
		IV Semester					
	Course		Hou	urs/W	⁷ eek	Credit	Maximum
	Code	Course Name	L	T	P	C	marks
22	MT24402	MANUFACTURING TECHNOLOGY LABORATORY	0	0	3	1.5	100
Ol	bjective(s)	 Demonstration and study of the va Able to use lathe machine for diffe Able to use shaping / slotting machine for d Able to use hobbing machine for d Able to manufacture tools using co 	erent ma nine for ifferent	differ mach	ng pro	achining p	
Outcome(s) After completing the course the student will be able to 1. Demonstrate skills to machine cylindrical components using Lathe. 2. Exhibit skills to cut spur gear using gear hobbing and milling maching. 3. Express skills to do grinding operation in cylindrical grinding maching.						nine.	
		LIST OF EXPERIM	MENTS	}			
1.	Turning –	Step and Taper					
2.	Thread Cu	ıtting					
3.	Knurling a	and counter sinking					
4.	Drilling, 7	Taping and Reaming					
5.	Surface M	lilling					
6.	Spur Gear	Cutting					
7.	Helical Go	ear Cutting					
8.	Cutting K	ey Ways					
9.	Machining	g V- block					
10.	Surface G	rinding					
	<u>I</u>	Tota	l hours	to be	taught	30	Periods



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V SEMESTER



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V Semester

		, Sellester										
Sl. No.	Course code	Course Title	Category	L	T	P	C					
	THEORY											
1	22MT14501	Applied Hydraulics and Pneumatics	PC	3	1	0	4					
2	22MT14502	Microprocessor and Microcontroller	PC	3	0	0	3					
3	22MT14503	Automotive Electronics	PC	3	0	0	3					
4		Professional Elective – 2	PE	3	0	0	3					
5	22MA12501	Interpretation Analysis and Critical Thinking Skills	OE	3	0	0	3					
6		Open Elective – 4	OE	3	0	0	3					
		PRACTICAL										
7	22MT24501	Automation Laboratory	PC	0	0	3	1.5					
8	22MT24502	Microprocessor and Microcontroller Laboratory	PC	0	0	3	1.5					
9	22EN60002	Interview Skills and Soft Skills	EEC	0	1	2	2					
'		TOTAL	6 0	18	2	8	24					



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Department	Mechatronics	Pr	ogram Code	1101			
	V Semeste	er					
Course code	Course Name	Н	Hours/week Credit			Maximum Marks	
22MT14501	APPLIED HYDRAULICS ANDPNEUMATICS	L 3	T	100			
 ANDPNEUMATICS 3 1 0 4 Know the fundamental principles, design and operation of hydraulic and pneumatic components and systems. To impart knowledge about Classification of hydraulic actuators and valves. Basic concepts of fluid power system design - Hydraulic oils and Hydraulic circuit. Describe the basic function, structure, and operation of pneumatic components' and pneumatic power system design. Identify possible causes of some common hydraulic component and system failures. 							
Outcome(s)	 The students will be able to Explain the fluid power system Identify suitable hydraulic actual Choose the suitable fluid power Choose the suitable pneumatic of Design fluid power circuit for great 	tors for control	r differe l compo ents for	ent apponents r diffe	plications. for variou	is applications.	
UNIT-I	FLUID POWER PRINCIPLES A	ND HY	DRAU	JLIC	PUMPS	(9+3)	
Properties of fluid Power and Torque Construction, Wo	luid power- Advantages and Applicateds – Basics of Hydraulics – Pascal's lee. Problems Sources of Hydraulic poorking, Design, Advantages, Disadva Fixed and Variable displacement pum HYDRAULIC ACTUATORS AND	Law- P wer: Po ntages, ps-Prol	rinciple umping Perforblems.	es of f	flow – Frie ory – Pumj	ction los- Work, p Classification-	
Hydraulic motors Types, Construct	tors: Cylinders— Types and constru Control Components: Direction control tion and Operation- Servo and Pro ories: Reservoirs, Pressure Switches-	ol, Flo	w contr al valv	rol an ⁄es -	d Pressure Application	c cushioning – e control valves- ons – Types of	

Problems.

UNIT-III HYDRAULIC SYSTEMS (9+3)

Accumulators, Intensifiers, Industrial hydraulic circuits- Regenerative, Pump Unloading, Double-pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-safe, Speed control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical Hydraulic servo systems.

UNIT-IV PNEUMATIC SYSTEMS

Properties of air—Perfect Gas Laws- Compressors- Filter, Regulator, Lubricator, Muffler, Air controlics Valves, Quick Exhaust valves, Pneumatic actuators, Design of pneumatic circuit cascade methods College Electro pneumatic circuits, Introduction to Fluidics, Pneumatic logic circuits.



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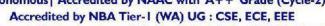
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UNIT-V ADVANCEMENTS IN FLUID POWER ENGINEERING								r	((9+3)
Overvi	Overview of hydro pneumatics; Industrial internet of things for monitoring, control and diagnostics of									
system	systems for fluid power applications.									
Progra	mmable	Logic	Controll	er: Const	ruction,	programming	methods,	timers	and	counters;
Progra	Programming using ladder logic diagrams.									
					Total hou	urs to be taught	60 P	eriods		
TEX	г воок:									
1	Anthony	Esposit	o, "Fluid	Power wit	h Applica	ations", Prentic	e Hall, 2009	€.		
REFI	REFERENCES:									
1	Shanmug	gasunda	ram.K, "I	Hydraulic a	and Pneur	matic Controls'	, Chand &	Co, 2006	· •	
2	Majumda	ar, S.R.	., "Oil l	Hydraulics	Systems	s- Principles	and Mainte	enance",	Tata	McGraw



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Department	Mechatronics		ramm Code	e	1101			
	V Semester	r						
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks		
22MT14502	MICROPROCESSOR AND MICROCONTROLLER	L 3	T 0	P 0	C 3	100		
 The student should be made to: Study the Architecture of 8086 microprocessor. Learn the design aspects of I/O and Memory Interfacing circuits. Study the Architecture of 8051 microcontroller. Learn the design aspects of 8051 interfacing program using Microcontroller. Study the basics of Arduino Programming. 								
On the successful completion of the course, students will be able to 1. Explain the architecture and instruction set of 8086 Microprocessor and its configuration. 2. Discuss the functions of various interfacing IC. 3. Explain the architecture and instruction set of Microcontroller. 4. Design different interfacing applications using microcontrollers and peripherals. 5. Construct systems using Arduino programming for real time applications.								
UNIT-I	8086 PROCESSOR AND CONFIG	URAT	ION			(9)		
directives – Asse Stacks - Procedu	086 – Microprocessor architecture – Addembly language programming – Modulures – Macros – Interrupts and interrusts system bus timing –System design us	ar Prog pt serv	gramm ice ro	ing - l utines	Linking at – 8086 s	nd Relocation - ignals – Basic		
UNIT-II	8086 I/O INTERFACING					(9)		
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications - Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller. UNIT-III MICROCONTROLLER (9)								
	8051 – Special Function Registers	(SFRs	s) - I/	O Pir	ns Ports			
	Addressing modes - Assembly language							
UNIT-IV	8051 MICROCONTROLLER INTI	ERFA	CING			(9)		
Programming 8051 Timers - Serial Port Programming - Interrupts Programming - LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface Stepper Motor and Waveform generation. Projessor and Head								

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UNIT-V INTRODUCTION TO ARDUINO PROGRAMMING

(9)

UNI	INTRODUCTION TO ARDUINO PROGRAMMING (9)						
Introduction to ARDUINO, ARDUINO History and Family – Data Types - Function Libraries – Different types of Sensors – Motor Control - Interfacing Modules – Programming Basics – Applications – Case studies.							
	Total hours to be taught 45 Periods						
TEX	T BOOKS:						
1	Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.						
2	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.						
3	Arduino Programming: The Ultimate Guide For Making The Best Of Your Arduino Programming Projects, Paperback – 7 December 2019 by Ryan Turner.						
REF	ERENCE:						
1	Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.						
2	Microcontrollers: Architecture, Programming, Interfacing and System Design by Rajkamal, Pearson Education India, 2009.						



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Department	Mechatronics	Progr	amme	Code	1101 & MCT			
	V Semeste	r						
Course code	Course Name	Н	ours/w	Maximum marks				
22MT14503		L	T	P	C			
	AUTOMOTIVE ELECTRONICS	3	0	0	3	100		
Objective(s)	 To know the basic idea about I To know the various sensors us To understand the control syste To know the working of various To study the advanced systems 	sed in a ems for us auto	automo r auton motive	otive an nobiles safety	systems.	king.		
Outcome(s)	Student will be able to 1. Know the basic idea about Engine system. 2. Know the various sensors used in automotive and its working.							
UNIT-I	BASICS OF ENGINES					(9)		

Operating principles of IC engine – major engine components – engine cylinder arrangements – the ignition systems – Electronic ignition, direct ignition, injection systems – working of the carburetor – throttle body injection – Multipoint fuel injection.

UNIT-II SENSORS AND ACTUATORS

(9)

Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall Effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, and vacuum operated actuator

UNIT-III DIGITAL POWERTRAIN & VECHILE MOTION CONTROL

Introduction – Digital Engine Control, Features – Control Modes for fuel control – EGR Control – Electronic Ignition control – Integrated engine control – Representative cruise control system- Cruise control Electronics –ABS – Electronic suspension system – four-wheel steering.

UNIT-IV CHASSIS, COMFORT AND SAFETY SYSTEMS

(9)

Traction control system – Cruise control system – electronic control of automatic transmission –antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralizeddoor locking system – climate control of cars.

UNIT-V AUTOMOTIVE INSTRUMENTATIONS, DIAGNOSTICS & PROTECTION

(9)

Modern automotive Instrumentation – I/O signal conversion – Display devices – flat panel display – CAN Network- Telematics – GPS Navigation – Electronics control system diagnostics – Model based sensor failuredetection

Total hours to be taught

45 Periods



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TEX	T BOOK:
1	Ribbens, "Understanding Automotive Electronics", 7th Edition, Elsevier, Indian Reprint, 2013.
REF	ERENCES:
1	Tom Denton, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers, 2000.
2	Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls", DelmarPublishers, 2001.
3	Richard K. Dupuy "Fuel System and Emission controls", Check Chart Publication, 2000.
4	Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.

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	V Semeste	r							
Course Code	Course Name	Hours/Week			Credit	Maximum Marks			
	INTERPRETATION, ANALYSIS	L	T						
22MA12501	AND CRITICAL THINKING	2	1	0	3	100			
The students should be made do: • To develop the students logical thinking skills and apply it in the real life scenarios. • To learn the strategies of solving Quantitative ability problems. • To enrich the verbal ability of the students. • To strengthen the basic programming skills of placements • Develop the skill of computation with sequences and series									
At the end of the course the students will be able to: Identify the techniques to solve Image interpretation and Relationship. Use Techniques to solve Logical Reasoning questions Interpret data, manipulate and summarize the information in order to answer Critical questions. Identify the core skills associated with Critical Thinking. Apply the basic concepts to solve problems on Surds, Pipes, Cisterns, Permutation and Combination.									
UNIT-I	VERBAL ABILITY					9			
	etails – Verbal Reasoning test – Typ Solved Problems.	es of	image	e inte	rpretation	- Relationship -			
UNIT-II	LOGICAL REASONING					9			
	letion and Para Jumbles – Logical conne Logical Deductions using Venn diagram.	ectives	- Тур	es of	Logical Re	lationship – Types			
UNIT-III	DATA INTERPRETATION AND DAT	ΓA SU	FFICI	ENC	Y	9			
Ages – Problems on Ages – Concepts and basics – Set Theory– Set Operation – types of sets – solved problems – Calendars – Odd days – Leap year – counting of odd days, finding exact date – Data interpretation – Tabulation – Bar graphs – Pie charts – Line graphs – Data sufficiency based on problems.									
UNIT-IV	CRITICAL REASONING					9			
Price – Rule	- Cuboids - Cube - Cylinder - Cone of Alligation - Boats and Streams - Sp - Rate of Stream - Critical Reasoning -	eed in	Down	n Stre	am and u				

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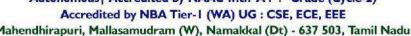
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UNIT	-V ARITHMETICAL ABILITY	9				
Indices and Surds – Law's of Indices - Law's of Surds - Pipes and Cisterns – Problems based on In- let and Out-let, Part of tank filled, Time based problems - Permutation and Combination – Factorial – Number of Permutation – Number of Combination – Solved Problems.						
	TOTAL 45 Hours					
TE	XTBOOK:					
1.	"Quantitative Aptitude" – R.S. Aggarwal, S.Chand and Company Ltd, New Delhi – 1	10055.				
2.	2. A Modern Approach to Verbal and Non-Verbal Reasoning by R.S.Aggarwal, S.Chand and Company Ltd (2012), New Delhi – 110055.					
REFI	REFERENCES:					
1.	Test of Reasoning for Competitive Examinations, 4th Edition by Edgar Thorpe, Tata Hill Publication, 2010.	n McGraw				
2.	Quantitative Aptitude for Competitive Examinations 4th Edition by Abhijit Guha, Tata Hill Publication (2010).	a McGraw				



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Programme Department 1101 & MCT Mechatronics Code & Name V Semester Hours/Week Credit Course Maximum **Course Name** Code Marks C \mathbf{L} T 22MT24501 **AUTOMATION LABORATORY** 0 0 3 1.5 100 To introduce and provide hand on experience to students to design and test hydraulic circuit to control press, flow etc., Objective(s) To provide hands on experience to design and test the pneumatic circuit to perform basic operations. To introduce the Automation studio software to simulate hydraulic, pneumatic and electrical circuit. At the end of the course, the student should be able to: 1. Ability to design and test hydraulic, pneumatic circuits. Outcome(s) 2. Use of Automation studio software for simulation of hydraulic, pneumatic and electrical circuits. LIST OF EXPERIMENTS Design and testing of hydraulic circuits such as Pressure control i. Flow control ii. 1. iii. Direction control Design of circuit with programmed logic sequence, using an optional PLC in hydraulic Electrohydraulic Trainer. Design and testing of pneumatic circuits such as Pressure control i. ii. Flow control 2. iii. Direction control Circuits with logic controls iv. Circuits with timers v. Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic Trainer. vi. 3. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation studio software.

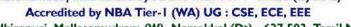
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45 Periods

Total hours to be taught



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Department		t	Mechatronics		Programme Code & Name				
			V Semeste	er					
Course Code					Ho	urs/W	eek	Credit	Maximum
			Course Name		L	T	P	C	Marks
22]	MT24502	M	MICROPROCESSORS AND ICROCONTROLLERS LABORATO	RY	0	0	2	1	100
Ob	ojective(s)		 To Introduce ALP concepts, features Write ALP for arithmetic and logica Differentiate Serial and Parallel Inte Interface different I/O's with Microp 	l opera rface.	ations i			3051.	
Oı	ıtcome(s)		he end of the course, the student should 1. Write ALP Programs for fixed and I 2. Interface different I/O's with proces 3. Generate waveforms using Microproduction 4. Execute Programs in 8051.	be able Floatin sor.	e to: g Poin	t and A	Arithm	etic operat	ions.
			LISTOF EXPER	IMEN	NTS				
808	6 and 8051	Progr	ams						
1.	Programs	for 16	6-bit arithmetic operations for 8086 (usin	g Vari	ous A	ldress	ing Mo	odes)	
2.	Program f	or sor	ting an array for 8086.						
3.	Program f	or sea	arching for a number or character in a stri	ing for	8086.				
4.	Program f	or str	ing manipulations for 8086.						
5.	Program f	or dig	ital clock design using 8086.						
6.	Interfacin	g AD	C and DAC to 8086.						
7.	Parallel communication between two microprocessors using 8255.								
8.	Serial communication between two microprocessor kits using 8251.								
9.	Interfacing to 8086 and programming to control stepper motor.								
10.	Programming using arithmetic, logical and bit manipulation instructions of 8051.								
11.	Program and verify Timer/Counter in 8051.								
12.	2. Interfacing Matrix/Keyboard to 8051.								
				Tota	l hours	to be	taught	45	Periods

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	SEMESTE	ZR –	$\overline{\mathbf{V}}$					
Course	Course Name		urs / \	Week	Credit	Maximum Marks		
Code	Course Name	L	T	P	C			
22SH60002	INTERVIEW SKILLS AND SOFT SKILLS	0	1	2	2	100		
	To improve the learners reading	g flu	ency s	kills th	rough ext	ensive reading		
	> To encourage the students to e	nrich	their	writing	skills for	•		
	academic andprofessional purp	poses	;					
Objectives	To help the learners obtain spe situation.	aking	g skills	in bot	h formal a	and informal		
	To equip them with presentation	on sk	ills ne	eded fo	or academ	ic as well as		
	workplacecontexts.							
	> To make them acquire intervie					n the career aspects		
	At the end of the course, the learner							
Outcomes	Analyse the content and apply necessary.				ills efficie	ently wherever		
	Create profile and other essential documents.							
	Demonstrate speaking skills ef		•					
	Apply suitable formats and pre			-		•		
	Demonstrate soft skills effective	vely a	at the t	ime of	interview	-		
UNIT I						9 Hrs		
	orehension - Reading Passages with Moction, Paragraph Writing – Narrative, D	-		_		_		
Comprehension		te – [E-mail	and T	elephone,	Listening		
UNIT III	ogues – Workshop.					9 Hrs		
	on and Introducing others, Greeting, A	nole	ories 1	Reques	t – Forma			
	ion – Useful Phrases, Do's and Don'ts,	-	_	-				
UNIT IV						9 Hrs		
	kills – PPT Preparation, Importance of blic Speaking, Stage Presentation – Mod				-verbal C	ommunication,		
UNIT V						9 Hrs		
	s – Face to Face interview, Telephonic	Inte	rview,	Mock	Interview	- Frequently Asked		
Interview Ques	stions.							
(D) 41 3					Fotal Hou	ırs 45		
	Ieenakshi & Sangeeta Sharma, <i>Technica</i> ford University Press, New Delhi. 2015		mmun	ication	: Principl	es and Practice,		
, , , , , ,	· · · · · · · · · · · · · · · · · · ·				/ W	Nr 2'		

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Ref	erences:
1	Anderson, Paul V., <i>Technical Communication: A Reader-Centered Approach</i> . Cengage, New Delhi. 2008.
2	Muralikrishna, & Sunita Mishra, <i>Communication Skills for Engineers</i> , Pearson, New Delhi. 2011.
3	Sharma, Sangeetha & Binod Mishra, <i>Communication Skills for Engineers and Scientists</i> , PHI Learning, New Delhi. 2009.
4	Smith-Worthington, Darlene & Sue Jefferson, <i>Technical Writing for Success</i> , Cengage, Mason USA, 2007.



VI SEMESTER



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		VI Semester			I			
Sl. No.	Course code	L	Т	P	C			
		THEORY						
1	22MT14601	Programmable Logic Controller & its Applications	PC	3	1	0	4	
2	22MT14602	Virtual Instrumentation	PC	3	0	0	3	
3	22MT14603	Automation in Food Processing and Technology	PC	3	0	0	3	
4	22MBAT6S06	Managerial Skills, Project and Quality Management	HS	3	0	0	3	
5		Professional Elective – 3	PE	3	0	0	3	
6		Open Elective – 5	OE	3	0	0	3	
7	22MC60001	Constitution of India	MC	3	-	-	-	
PRACTICAL								
8	22MT24601	PLC Laboratory	PC	0	0	3	1.5	
9	22MT24602	Virtual Instrumentation Laboratory	PC	0	0	3	1.5	
10	22MT34601	Presentation Skills and Technical Seminar	EEC	0	0	2	1	

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18

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23

TOTAL



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Programme Department Mechatronics 1101 & MCT Code & Name VI Semester Maximum Course code **Course Name** Hours/week Credit Marks $\overline{\mathbf{T}}$ PROGRAMMABLE LOGIC \mathbf{L} P \mathbf{C} 22MT14601 100 **CONTROLLER & ITS** 3 1 4 0 APPLICATIONS The student should be able To have knowledge on PLC. To acquire the knowledge on programming of PLC. Objective(s) To understand different PLC registers and their description. To have knowledge on data handling functions of PLC. To know how to handle analog signal and converting of A/D in PLC. On the successful completion of the course, students will be able to 1. **Describe** the PLCs and their I/O modules. 2. **Develop** control algorithms to PLC using ladder logic etc. Outcome(s) 3. **Outline** PLC registers for effective utilization in different applications. 4. **Compare** various types of PLC registers and instructions.

PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

5. **Design** PID controller with PLC.

UNIT-II PLC PROGRAMMING

PLC BASICS

UNIT-I

(9)

(9)

PLC Programming simple instructions- Programming EXAMINE ON and EXAMINE OFF instructions- Electromagnetic control relays- Motor starters, Manually operated switches, Mechanically operated switches and Proximity switches- Output control devices, Latching relays- PLC ladder diagram- Converting simple relay diagram in to PLC relay ladder diagram.

UNIT-III PLC REGISTERS

(9)

Characteristics of Registers, module addressing, holding registers, input registers, output registers. PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT-IV PROGRAM CONTROL INSTRUCTIONS

(9)

Introduction, Master control Reset instructions, JUMP instruction and subroutines, immediate input and output, forcing external I/O address- Data Manipulating instructions; Manipulation, transfer operations, compare, manipulating programs- math instructions; Addition, Subtraction, Multiplication, Division.

UNIT-V ANALOG PLC OPERATION

(9)

Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Total hours to be taught

45 Periods



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TEX	T BOOK:
1	Frank D. Petruzella, "Programmable Logic Controllers", McGraw-Hill Companies, 3rdEdition, March 2013.
2	Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI.
3	Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
REF	ERENCES:
1	Siemens "PLC Handbook".
2	Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning. Programmable Logic Controllers –W.Bolton-Elsevier publisher.

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Department	Mechatronics	Programme Code & Name 1101 & MCT					
	VI Semeste	r					
Course code	Course Name	Н	ours/w	Maximum Marks			
22MT14602	VIRTUAL	L 3	T 0	P 0	C 3	100	
	INSTRUMENTATION	3	U	U	3		
Objective(s)	and applications of virtual ins	udent should be able to: Introduce the principle, programming technique with instrument interfaces and applications of virtual instruments and to understand the basics of data acquisition are introduced in mechatronics systems.					
Outcomes	 On the successful completion of the course, students will be able to Understand the evolution, advantages, techniques, architecture and applications of visual instrumentation. Acquiring knowledge on VI programming techniques. Study about the basics of data acquisition. Understanding the concept of common instrument interfaces with industrial applications. Study about the use of analysis tools with various applications. 						
UNIT-I	REVIEW OF VIRTUAL INSTRUM					(9)	
	ctives, advantages, block diagram and artical programming in data flow, compari						
UNIT-II	VI PROGRAMMING TECHNIQU	ES				(9)	
	loops and charts, arrays, clusters and gradobal variables, string and file I/O.	aphs, c	ase and	l seque	ence structi	ıres, formula	
UNIT-III	DATA ACQUISTION BASICS					(9)	
AOC.OAC. 010. Counters & timers. PC Hardware structure, timing. Interrupts OMA, software and hardwareinstallation.							
UNIT-IV	COMMON INSTRUMENT INTERFACES (9)						
Current loop, RS.232C/RS.485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc.,networking basics for office &. Industrial applications, Visa and IVI, image acquisition and processing. Motion control.							
UNIT-V USE OF ANALYSIS TOOLS (9)							
	ns, power spectrum correlation methods,	windo	wing &	ż filter	ring, VI app	olication in	
Total hours to be taught 45 Periods							



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TEX'	T BOOK:
1	Gupta," Virtual Instrumentation Using Lab view" 2 nd Edition, Tata McGraw-Hill Education,
	2010.
REF	ERENCE:
1	Gary Jonson, "Labview Graphical Programming", Fourth Edition, McGraw Hill, New York,
	2006.
2	Gupta.S., Gupta.J.P., "PC interfacing for Data Acquisition & Process Control", Second
	Edition, Instrument Society of America, 1994.
3	Sokoloff; "Basic concepts of Labview 4", Prentice Hall Inc., New Jersey 1998.



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Department	Mechatronics	Programme Code 1101					MCT		
	VI Semeste	er							
Course code	Course Name	H	ours/w	eek	Credit		aximum narks		
003 FTT4 4 CO 2	AUTOMATION IN FOOD	L	T	P	C		100		
22MT14603	PROCESSING AND TECHNOLOGY	3	0	0	3		100		
	To study the Basic automation	techni	que an	d proce	ess contro	l parar	neters.		
	 To impact knowledge of auton 	nation i	in food	indus	try.				
Objective(s)	• To equip the students with the	variou	s Instru	ıments	in food p	rocess	ing.		
	 To acquaint the automation techniques in fruit and vegetables process. 								
	 To acquaint the automation techniques in meat and poultry process. 								
	Student will be able to								
	1. Gain knowledge in automation and process control parameters.								
Outcome(s)	2. Understand the automation process in food industry.								
Outcome(s)	3. Know the various instruments in food processing.								
	4. Study the automation techniques in fruit and vegetables process.								
	5. Study the automation techniqu				<u> </u>				
UNIT-I	INTRODUCTION TO AUTOMAT						` '		
	process control, identification, variables		_			•	_		
_	ns, open and closed loop, feedback an suringelement controller and final control				-		electronic		
			iems, i	-, F1, F	TD Contro	018.			
	UNIT-II AUTOMATION IN FOOD INDUSTRY (9)					` ′			
Automatic process control in food industry. Process control methods in food industry, current, future									
trends.Robotics in food industry, specification of food sector robot.									
						(9)			
Instrumentation in food processing, sensors for automation, measurement methods, applications,									
implementation.	machine vision, optical sensors and spectroscopic techniques. SCADA; standards, application and								
UNIT-IV	AUTOMATION IN FRUIT AND V	EGET	ABLE	S PRO	OCESS		(9)		

Automation in sorting, thermal processing, fresh produce: Automation in bulk sorting; principles, requirements. Automation in food chilling and freezing; in storage, transport, retail systems automationin fruit vegetable processing; cleaning, grading, canning.

UNIT-V **AUTOMATION IN MEAT AND POULTRY PROCESS**

Automation in packaging and meat, poultry, fish processing: Automation in meat processing, carcass production, separation; before and after chilling. Automation in poultry industry; hanging, conveying, processing, packing Automation in sea food processing, in unit operations associated. Automation in packaging of food products.

Total hours to be taught

45 Periods

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TEXT BOOKS: Robotics and Automation in the Food Industry by D Caldwell, Elsevier Science, Wood head 1 Publishing. Eackman DP. 1972. Automatic Process Control. Wiley Eastern. 2 **REFERENCE:** George Stephanopoulos, "Chemical Process Control", Prentice Hall of India, 1990. Luyben, W. L, Process Modeling, Simulation and Control for Chemical Engineers, McGraw 2 hill, 1973. 3 Considine DM. 1974. Process Instruments and Controls. Mc-Graw-Hill. Thermal Processing of Foods: Control and Automation by K. P. Sandeep March 2011, Wiley-4 Blackwell.

Gouri S Mittal, "Computerized control system in the food industry", Marcel Decker Inc. 1997.



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Regulations 2022							
Department	Mechatronics	P	rograi	mme	Code	1101 & MCT	
Course Code	Course Name	Но	Hours/Week Credit			Maximum Marks	
22MBAT6S06	Managerial Skills, Project	L	T	P	C	100	
221/12/11/05/0	and Quality Management	3	0	0	3	100	
	VI Seme	ester					
Objectives	This course is designed to: 1. Develop knowledge and skills needed for the successful managerial performance. 2. Develop team building and communication skills in learners for working in multi-disciplinary teams. 3. Enable the learners to plan, schedule and manage projects. 4. Facilitate budgeting and finance, and evaluate projects 5. Understand the importance of quality concepts and principles.						
Upon completion of this course, the Learners will be able to: CO1: Demonstrate applicable knowledge and skills needed for managerial effectiveness. CO2: Demonstrate team building and communication skills for working in multi-disciplinary teams. CO3: Plan, schedule and manage projects CO4: Plan budgeting, manage finance and evaluate projects CO5: Summarize the quality concepts and principles.							
UNIT-I	INTRODUCTION TO MANAGERIAL SKILLS 9						

Introduction to Self Awareness - Self Portrait - Self Assessment - Life-long learning. Definition of Life Skills and Managerial Skills - Need and Importance of Skills. Decision Making and Problem Solving: Problem Analysis – Techniques – Steps; Problem solving: Characteristics of Complex problems - Problem Solving Strategies - Barriers.; Lateral thinking Need and Importance of Lateral Thinking; Logic and Rationality – Functions – Personal and Work ethics.

9 **UNIT-II** TEAM BUILDING AND EFFECTIVE COMMUNICATION

Team Building: Developing teams and team work, advantages of team, leading team, team membership, traits of working in multi-disciplinary teams. Effective Communication: Need and Importance – Techniques and Types - Verbal and Non-Verbal Communication - Barriers to communication – Overcoming barriers – Multiple Intelligences – 360 degree evaluation, Case Study.

UNIT-III PROJECT MANAGEMENT

9

Project: Meaning and Importance of terms 'Event', Activity'. 'Time'. Identification of project opportunities, Screening of Project Ideas. Criteria for project selection, Project planning and scheduling - Application of CPM and PERT - Examples and case studies, JESUDAS, M.E., PD.D

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UNIT-IV

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Introduction to Budgeting and Finance, kinds of Project Evaluation, Evaluation Techniques – Non-discounted cash flow methods, Discounted cash flow Methods, Evaluation of Project cost, Capital budgeting and its methods. Financial management of Projects. Project Risk and its mitigation – Examples and case studies.

UNIT-V QUALITY CONCEPTS AND PRINCIPLES 9

BUDGETING AND FINANCE

Introduction - Need for Quality - Evolution of Quality - Definition of Quality - Dimensions of Manufacturing Quality and Service Quality. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward Performance appal - Continuous process improvement, 6, 5s, Kaizen - Case Study.

	Total 45 HOURS	
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TEX'	TBOOKS:
1	David A.Whetten and Kim S.Cameron, Developing Management Skills, – PHI, 2011.
2	Harper, Nancy Life Skills: Essential for Personal Growth on the Ever Changing Road of Life. Bloomington, IN: Author House, 2011.
3	Adair, J. Decision Making and Problem Solving. UK: Kogan Page Publishers.2013.
4	James R Evans, Quality Management, Cengage Learning India Private Limited 2010.
5	Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
REF	ERENCES:
1	Kallet, Michael Think Smarter: Critical Thinking to Improve Problem-Solving and Decision Making Skills. New Jersey: John Wiley & Sons, 2014.
2	Adair, J. & Allen, M. Time Management and Personal Development. London: Hawksmere, 1999.
3	Hattie, John Self-Concept. New York: Psychology Press, 2014.
4	Mcgrath E.H., S.J., Basic Managerial Skills for all, 9th Edition, PHI, 2012
5	Amitava Mitra, Fundamentals of Quality Control & Improvement, Wiley Publications, 2012.



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Department	MECHATRONICS	Progr	amme	1101						
VI Semester										
Course code	Course Name	Pe	eriods/	iods/week Credit		Maximum marks				
22MC60001	CONSTITUTION OF INDIA	L	T	P	C	100				
		3	0	0	-					
	 To know about the salient features of the Constitution of India. 									
	 To gain knowledge about structure 	cture ar	d func	tions of U	Jnion Gov	vernment.				
Objectives	To learn about the structure an	d funct	ions of	f State Go	vernment	•				
	To understand about amendment			Constituti	ion, Judic	ial review.				
	To study in detail about the In-									
	On completion of the course, the lea									
	• Summarize the features of the				d observe	the				
	fundamental duties, rights and	-								
Outcomes	Explain the functioning of Ind	_		tary syste	m at the C	Center and the				
	responsibilities of important functionaries.									
	• Describe the functioning of State Government and important functionaries.									
	Recognize Amendments in Indian Constitution and Judicial review.									
	Illustrate the composition and				ety.					
UNIT-I INTRODUCTION ABOUT INDIAN CONSTITUTION 9										
Historical Backg	round - Constituent Assembly of Indi	ia – Ro	le and	salient fo	eatures -	Philosophical				
foundations of the	he Indian Constitution - Preamble - I	Fundam	ental l	Rights –	Directive	Principles of				
State Policy – Fu	indamental Duties – Citizenship – Cons	stitutior	al Ren	nedies for	citizens.					
UNIT-II	STRUCTURE AND FUNCTION (OF UN	ION G	OVERN	MENT	9				
Parliamentary sy	stem – Legislature, Executive. Union G	Govern	ment –	Structure	es of the U	Jnion				
Government. Fur	nctions and Responsibilities of Presider	nt – Vic	e Presi	dent – Pr	ime Minis	ster – Cabinet				
– Council of Mir	nisters, Union Territories.									
UNIT-III	STRUCTURE AND FUNCTION (OF STA	ATE G	OVERN	MENT	9				
State Legislature	e - State Government – Structure and	d Func	tions -	- Govern	or – Chie	ef Minister –				
	al Provisions (Article 370. 371, 371J)									
_	other Subordinate Courts, Judicial revi				•					
UNIT-IV CONSTITUTION FUNCTIONS, AMENDMENTS AND REVIEW 9										
Indian Federal S	ystem – Centre-State Relations – Pres	ident's	Rule -	- Assessn	nent of w	orking of the				
	System in India - Constitutional A					· ·				
_	How and Why) and Important Co									
7,9,10,12,42,44, 61, 73, 74, 75, 86, and 91, 94, 95, 100, 101, 118. Savior of the Constitution – The										
	of India – The Hon'ble Chief Justice									
_	eview of Parliamentary and Executive			(YVC	, · ·				

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UNIT-V INDIAN SOCIETY

9

Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections - Special Constitutional Provisions for SC & ST, OBC, Special Provision for Women, Children & Backward Classes.

TOTAL P	ERIODS
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45

TEX	TBOOKS:
1	Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New
	Delhi
2	R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3	Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
4	K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru
	University, New Delhi.
REF	ERENCES:
1	Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New
	Delhi.
2	U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalaendhar
3	R.N. Sharma, "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.



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Department	Mechatronics Programme Code & Name				110	01 & MCT
	VI Seme	ster				
Course		Но	urs/W	Veek	Credit	Maximum
Code	Course Name	L	Т	P	C	Marks
22MT24601	PLC LABORATORY	0	0	3	1.5	100
Objective(s) Outcome(s)	 Identify the basic components Assemble and arrange a simple Explain the operation of elect Operate simple loads using re After successfully completing this labeled Convert a simple electrical lace Know the difference bette components. Sketch the ladder programs us 	le control be romagneticallays, switch coratory, you dder diagran tween phy	oard. ally cones and ou show m to a visical	ontrol d pusl uld be PLC com	abuttons. e able to: program. ponents	and program
	Operate the program, via place LIST OF E	ing the PLO	C in th			
1. Study of						
-	ion of logic gates using PLC.					
	ion of Boolean Expression using PLC					
	ial switching of motors using PLC – Si	mulation.				
-	vel control using PLC – simulation.					
	light controller using PLC-Simulation.					
7. Testing	of Relays- Simulation.					
8. Simulat	ion of Timer using PLC.					
9. Simulat	ion of Counter using PLC.					
10. Simulat	ion of Flip – Flops using PLC.					
11. Automa	ted Conveyor System using PLC.					
12. Modelin	ng and simulation of pneumatic and hyd	lraulics syst	tems u	sing	PLC.	
	7	Total hours	to be t	augh	t 4 5	5 Periods



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Depa	rtment	Mechatronics			ammo & Na		110	01 & MCT	
		VI Semes	ter						
Course Code		Course Name		Hours/Week			Credit	Maximum	
				L T		P	C	Marks	
22MT	Γ24602	VIRTUAL INSTRUMENTAT LABORATORY	VIRTUAL INSTRUMENTATION 0 0 3 1.5 1 LABORATORY						
Objec	ctive(s)	Understanding Virtual InstrumLearning Graphical ProgrammData Acquisition and Control	ning		•				
Outco	After successfully completing this laboratory, you should be able to: • Ability to design and implement virtual instruments • Apply virtual instrumentation techniques to solve practical engineering challenges.								
		LIST OF EX	XPERI	ME	NTS				
1.	Creating	Virtual Instrumentation for simple app	olicatio	ns.					
2. F	Program	ming exercises for loops and charts.							
3. F	Program	ming exercises for clusters and graphs.	•						
4. F	Program	ming exercises on case and sequence s	tructure	es, fi	le Inp	out / Ou	tput.		
5. I	Data Aco	quisition through Virtual Instrumentation	on.						
6. I	Develop	ing voltmeter using DAQ cards.							
7. I	Develop	ing signal generator using DAQ cards.							
8. S	Simulating reactor control using Virtual Instrumentation.								
9. F	Real time	e temperature control using Virtual Ins	trumen	tatic	n.				
		e sequential control of any batch proce							
		· · ·	Fotal h	ours	to be	taught	45	Periods	
						_			

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	Syllabus								
Departmen	Department Mechatronics Programme Code								
	VI Semester				<u> </u>				
Course	Course Name	Ho	urs/V	Veek	Credit	Maximum Marks			
Code		L	Т	P	C				
22MT34601	PRESENTATION SKILLS AND TECHNICAL SEMINAR	0	0	4	2	100			
Objective (s)	 To encourage the students to study advanced engineering developments. To prepare and present technical reports. To encourage the students to use various teaching aids such as over head projectors power point presentation and demonstrative models. 								
Outcome(s)	projectors, power point presentation and demonstrative models. At the end of the course, the student should be able to: 1. Ability to review, prepare and present technological developments. 2. Ability to face the placement interviews.								

- During the seminar session each student is expected to prepare and present a topic on engineering/technology, for duration of about 8 to 10 minutes.
- In a session of three periods per week, 15 students are expected to present the seminar.
- Each student is expected to present at least twice during the semester and the student is evaluated basedon that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student andmaintain attendance also.

• Evaluation is 100% internal and External.

Total hours to be taught

30 Periods



VII SEMESTER



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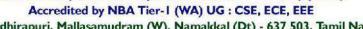
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	Regulation 2022									
	VII Semester									
Sl. No.	Course and Course Title Cotegory -									
		THEORY								
1	22MT14701	Robotics and Industrial Automation	PC	3	1	0	4			
2	22MT14703	Automation in Textile Industry	PC	3	0	0	3			
3	22MT14704	CNC Machining Technology	PC	3	0	0	3			
4		Professional Elective- 4	PE	3	0	0	3			
5		Professional Elective- 5	PE	3	0	0	3			
6		Professional Elective- 6	PE	3	0	0	3			
		PRACTICAL								
7	22MT24701	Robotics Laboratory	PC	0	0	3	1.5			
8	22MT24702	Computer Aided Design and Analysis Laboratory	PC	0	0	3	1.5			
9	22MT34701	Project Work (Phase - 1)	EEC	0	0	6	3			
		TOTAL		15	0	12	25			





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Department	Mechatronics	Pr	ogram Code		1101 & MCT											
VII Semester																
Course code	Course Name	Н	ours/w	Maximum marks												
22MT14701	ROBOTICS AND INDUSTRIAL AUTOMATION	L 3													C	100
Objective(s)	 To understand the basics of robotics, drives and power transmission system. To understand the different types and mechanisms of robotic end effectors and grippers. 															
Outcome(s)	 Express the basic concepts, laws, drives and power transmission system. Explain the types of grippers and end effectors and its functions. 															
UNIT-I	BASICS OF ROBOTICS (9+3)															
Introduction- Basic components of robot-Laws of robotics- classification of robot-work space-accuracy-resolution –repeatability of robot. Power transmission system: Electric drive, Hydraulic drive, Pneumatic drive. UNIT-II ROBOT END EFFECTORS (9+3)																
	ors: Introduction- types of End effectors erforce analysis- other types of griper- s				• •	griper										
UNIT-III	ROBOT MECHANICS					(9+3)										
Robot kinematics: Introduction- Matrix representation- rigid motion & homogeneous transformation forward & inverse kinematics- trajectory planning. Robot Dynamics: Introduction – Manipulator dynamics – Lagrange - Euler formulation- Newton - Euler formulation.																
UNIT-IV																
Machine vision: image acquisition, digital images-sampling and quantization-levels of computation Feature extraction-windowing technique- segmentation- Thresholding- edge detection- binary morphology - grey morphology.																
UNIT-V	ROBOT PROGRAMMING					(9+3)										
Robot programming: Robot Languages- Classification of robot language-Computer control and robot software-Val system and Languages- application of robots.																
Total hours to be taught 60 Periods																

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TEX	T BOOK:
1	M.P.Grover, M.Weis ,R.N. Nagal, N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata ,McGraw-Hill Education Pvt Limited, 2008.
REF	ERENCES:
1	SathyaRanjan Deb, "Robotics Technology & flexible Automation" Sixth edition, Tata McGraw- HillPublication, 2003.
2	K.S.Fu, R.C.Gonzalez, C.S.G.Le, "Robotics: Sensing, Vision & Intelligence", Tata McGraw- Hill Publication, 1987.
3	John.J.Craig, "Introduction to Robotics: Mechanics & control", Second edition, 2002.
4	Jazar, "Theory of Applied Robotics: Kinematics, Dynamics and Control", Springer, Indian Reprint, 2010.





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Department	Mechatronics	Programme Code & Name				01 & MCT	
	VII Semeste	er					
Course code	Course Name	Hours/week Credit			Hours/week Credit		Maximum marks
22MT14702	AUTOMATION IN TEXTILE	AUTOMATION IN TEXTILE INDUSTRY L T P C 3 0 0 3		100			
Objective(s) Outcome(s)	 To know the basic processing into the desired spinning. To understand the basics of well and the basics of the student should able to Know the basic processing in the student should able to Understand the basics spinning Understand the basics of weaving Know the automation in spinning Know the automation in weaving 	ing proaving proving persisted in processing	cess. process	S. S.			
UNIT-I	BASICS PROCESSING OF TEXTI			OLOG	Y	(9)	
manufacturing, processing mac Finishing.	e technology and its advancements, intr Introduction to automation in textile inchines: Singeing, Designing, Scouring,	dustries	s. Obj	ectives	and proc	eess variables in yeing, Printing	
UNIT-II	BASICS OF SPINNING						
	M 1 . O1! .! 1		C 4			(9)	
	s flow chart – Objectives and process va om, Carding, Draw frame, Combing, Spo					achineries:	
UNIT-III						achineries:	
Weaving proces Warping, Sizing	om, Carding, Draw frame, Combing, Spe BASICS OF WEAVING s flowchart – Objectives and process valued beaming. Objectives and process valued beaming.	eed fran	me, Ri	ing fra	me, rotor s	achineries: spinning. (9) cory: Winding,	
Weaving proces Warping,Sizing denting and wea	om, Carding, Draw frame, Combing, Spe BASICS OF WEAVING s flowchart – Objectives and process valued beaming. Objectives and process valued beaming.	eed fran variable riables	es in v	ing fra	me, rotor s	achineries: spinning. (9) cory: Winding,	
Weaving proces Warping,Sizing denting and wea UNIT-IV Machinery mate switches – Prodes system for spinn	om, Carding, Draw frame, Combing, Spe BASICS OF WEAVING s flowchart – Objectives and process value and beaming. Objectives and process value ving.	variables CHIN ders & nd pre-	es in verification in west	weaving aving:	me, rotor s g preparat drawing in s – Auto 1 onitors. De	cory: Winding, n, knotting, (9) evelers – Safety ata acquisition	
Warping, Sizing denting and wear UNIT-IV Machinery mate switches – Produsystem for spinning - Elect UNIT-V	om, Carding, Draw frame, Combing, Speak BASICS OF WEAVING s flowchart – Objectives and process value and beaming. Objectives and process value and beaming. Objectives and process value and beaming. AUTOMATION IN SPINNING MA rial flow and its variation controls – Feed action and quality monitors – Full doff and ingpreparatory, ring spinning – rotor spronics data interchange. AUTOMATION IN WEAVING MA	rariable riables CHIN ders & and pre-inning.	es in version were set ler. Appl	weaving aving:	me, rotor s g preparat drawing in s – Auto 1 onitors. Do of CAD	cory: Winding, n, knotting, (9) evelers – Safet ata acquisition / CAM / CIM	
Weaving proces Warping, Sizing denting and wea UNIT-IV Machinery mate switches – Prode system for spinn spinning - Elect UNIT-V Concept of state and output equa	om, Carding, Draw frame, Combing, Spearage BASICS OF WEAVING s flowchart – Objectives and process value and beaming. Objectives and process value and beaming. AUTOMATION IN SPINNING MA rial flow and its variation controls – Feed action and quality monitors – Full doff at ingpreparatory, ring spinning – rotor spronics data interchange.	cariables CHIN ders & nd pre- inning. CHIN	es in voin weather the set ler and the set ler	weaving aving:	g preparat drawing in s – Auto l onitors. Do of CAD	cory: Winding, n, knotting, (9) evelers – Safet ata acquisition / CAM / CIM (9) lution of state	

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REF	ERENCE:
1	Chattopadhyay R. (Ed), "Advances in Technology of Yarn Production", NCUTE, IIT Delhi,
	2002.
2	Oxtoby E "Spun Yarn Technology" butter worth"s, London, New Edition 2002.
3	Lord P.R. and Mohammed M.H., "Weaving – Conversion of Yarn to Fabric",
3	MerrowBPublication,2001.
4	Krishna Kant, "Computer – Based Industrial Control", PHI Learning Pvt Ltd, 2nd edition, New
4	Delhi, 2011.
5	Venkatachalam. A and Ashok Kumar L, "Monograph on Instrumentation & Textile Control
J	Engineering" – 2005.
6	Berkstresser G A, Buchanan D R and Grady P, "Automation in the Textile Industry from
0	Fibers to Apparel", The Textile Institute, UK, 1995.
7	"Textiles Go On-line", the textile Institute, UK, 1996.
0	Nalura B C. "Theory and Applications of Automation Controls" New Age International (P)
8	Ltd Pub,1998.
9	Ormerod A, "Modern Development in spinning and Weaving Machinery", Butterworth"s,1993.





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Department	Mechatronics	Programme Code & Name				101 &	MCT					
	VII Semes	ter										
Course code	Course Name	Н	Hours/week Credit				Aaximum Marks					
22MT14703	CNC MACHINING	L	L T P C 3 0 0 3									100
	TECHNOLOGY											
	Understand evolution and prin	-										
	Describe constructional featur											
Objective(s)	Explain drives and positional to											
•	Write simple programs for Cl	NC turi	ning an	d mad	chining ce	enters	and					
	Generate CNCprograms for p	opular (CNC co	ontroll	ers.							
	 Describe tooling and work hol 	ding de	vices f	or CN	C machin	e tools	S					
	The students will be able to											
	1. The students can able to unders	tand ev	olution	and p	orinciple o	f CNO	C machine.					
	2. The students expose to design for	or guide	ways,	ball so	crew, gear	s, timi	ng belts and					
Outcome(s)	flexiblecouplings etc.,											
Outcome(s)	3. The student may exposure drives and controls for CNC machine tools.											
	4. The student may analysis and v											
	5. The students can able to unders		_	_	_							
	tools anddescribe constructions			-	-							
UNIT-I	INTRODUCTION TO CNC MACE	HINE T	OOLS	3			(9)					
	NC Technology, principles, features,				cations, (CNC						
concept, classific	cation of CNC Machines – turning cent	re, mac	hining	centre	, grinding	mach	ine, EDM,					
types of controls	ystems, CNC controllers, characteristic			s– Co	mputer Ai	ded In	spection.					
UNIT-II	STRUCTURE OF CNC MACHINE						(9)					
	uilding, structural details, configuration				•							
	of guide ways, elements used to conve											
	lating ball screw, planetary roller scre			_								
	, torque transmission elements – gears,	timing	beits, i	1ex1b1	e coupling	gs, Bea	(9)					
UNIT-III	DRIVES AND CONTROLS DC shunt motor, 3 phase AC inductio	n moto	r food	drivo	atannar	motor	, ,					
	d AC servomotors, Open loop and clo											
	o-resolver, gratings, moiré fringe grating											
UNIT-IV	CNC PROGRAMMING	,	,				(9)					
Coordinate syste	em, structure of a part program, G & M	Codes	s, tool l	ength	compens	ation,	cutter radius					
and toolnose rad	lius compensation, do loops, subrouting	es, canr	ned cyc	eles, n	nirror ima	ge, pa	rametric					
programming, m	achining cycles, programming for mach	_			ning centr							

Professor and Head Department of Mechatronics Mahendra Engineering College Mallasamudram, Namakkal

controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages.

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U	NIT-V	TOOLING AND WORK HOLDING DEVICES		(9)			
Introduction to cutting tool materials - Carbides, Ceramics, CBN, PCD-inserts classification-							
	PMK, NSH,qualified, semi qualified and preset tooling, tooling system for Machining centre and Turnin centre, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC						
mach		inig devices for rotating and fixed work parts, econo	inies of CNC, maintenar	ice of CNC			
		Total hours to be taught	45 Period	ls			
TEX	T BOOKS:						
1	HMT, "M	echatronics", Tata McGraw-Hill Publishing Compar	y Limited, New Delhi, 2	2005.			
2	Warren S.	Seamers, "Computer Numeric Control", Fourth Edit	ion, Thomson Delmar, 2	2002.			
REF	ERENCE:						
1	James Ma	dison, "CNC Machining Hand Book", Industrial Pre	ss Inc., 1996.				
2		s, John Polywka & Stanley Gabrel, "Programming o Press Inc, New York, 2002.	f CNC Machines", Seco	nd Edition,			
3	Peter Smi	d, "CNC Programming Hand book", Industrial Press	Inc., 2000.				



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Department	Mechatronics	Programme Code & Name			110	1 & MCT		
	VII Semester							
Course	Course Name	Ho	urs/W	⁷ eek	Credit	Maximum		
Code	Course Name	L	T P		C	Marks		
22MT24701	ROBOTICS LABORATORY	0	0	3	1.5	100		
Objective(s)	 To introduce different types of different parts and components. 	robotics	and d	emons	trate then	n to identify		
	 To write programming for simp etc., 	le operati	ions li	ke pic	k and plac	ce, rotoxim		
	At the end of the course, the student sho	uld be ab	le to:					
Outcome(s)	1. Use of Adam's software and MAT Lab software to model the different types							
	ofrobots and calculate work volume for different robots.							
	LIST OF EXPERI	MENTS						
1. Study of diffe	erent types of robots based on configuration	n and ap	plicati	on.				
2. Study of diffe	erent type of links and joints used in robot	S.						
3. Study of com	ponents of robots with drive system and e	nd effect	ors.					
4. Determination	n of maximum and minimum position of l	inks.						
5. Verification of coordinate sy	of transformation (position and orientatestem.	ion) wit	h res	pect t	o gripper	and world		
6. Estimation of	accuracy, repeatability and resolution.							
7. Robot progra	mming exercises.							
	То	tal hours	to be	taught	45	Periods		



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D)epartment	Mechatronics	Progr Code			e 1101 & MC		
		VII Semeste	r					
	Course		Ho	Hours/Week			Maximum	
	Code	Course Name	L	T	P	C	Marks	
22	2MT24702	CAD / CAM LABORATORY	0 0 3 1.5 100					
C	Objective(s)	 To gain practical experience in systems. To gain practical experience in To study the features of CNC M To expose students to modern of the compose of	handling Iachine T ontrol sys ous CNC	3D m ool. stems. mach	odelin	ng softwar	e systems.	
(Outcome(s)	 Draw 3D models and assemble Can explain the features of CNe Demonstrate manual part programilling centre. Demonstrate manual part prograturning centre. 	C machine amming	es. with C	3 and	M codes i	using CAM for	
		LIST OF EXPER)				
1.		a part using Pro-E /CATIA /UNIGRAP						
2.		a component using Pro-E /CATIA /UN						
3.		nd assembling of the mechanical compor						
4.	Modeling ar	nd assembling of the mechanical compor	ents usin	g Pro-	E/CA	TIA/UNI	GRAPHICS.	
5.	Modeling ar	nd assembling of the mechanical compor	ents usin	g Pro-	E/CA	TIA/UNIO	GRAPHICS.	
6.	Modeling ar	nd assembling of the mechanical compor	ents usin	g Pro-	E/CA	TIA/UNIO	GRAPHICS.	
7.	Modeling ar	nd tool path simulation using Master CA	M (MIL)	or any	CAN	Л package		
8.	Modeling ar	nd tool path simulation using Master CA	M (Lathe)	or an	y CA	M packag	e.	
9.	NC code ger	neration for milling using Master CAM (MIL) or a	any C	AM p	ackage.		
10.	NC code ger	neration for turning using Master CAM (Lathe) or	any (CAM 1	package.		
	1	То	tal hours	to be	aught	45 Peri	ods	

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Department	Mechatronics Programme Code & Name			1101 & MCT				
	VII Semester							
Course		Ho	urs/V	Veek	Credit	Maximum		
Code	Course Name		Т	P	C	Marks		
22MT34701	PROJECT WORK (PHASE – 1)	0	0	6	3	100		
Objective(s)	The main objective is to give an objective is given by the given is to give an objective is given by the given is given in the given in the given is given in the given in		•					
Outcome(s)	 Use of design principles and deve anycomponents. 	which isdesigned by them. At the end of the course, the student should be able to: 1. Use of design principles and develop conceptual and engineering design of anycomponents.						

GUIDELINE FOR REVIEW AND EVALUATION

- The students may be grouped into 2 to 4 and work under a project supervisor.
- The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and possible with an industry.
- A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department.
- At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total hours to be taught

30 Periods



VIII SEMESTER

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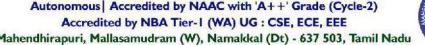
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		Regulation 2022					
		VIII Semester					
Sl. No.	Course code	Course Title	Category	L	T	P	C
		PRACTICAL					
1	22MT34801	Project Work (Phase – 2)	PW	0	0	12	6
		TOTAL		0	0	12	6



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		Syllabus					
Departmen	partment Mechatronics Programme Code & Name			1101 & MCT			
		VIII Semeste	r			<u>'</u>	
Course			Но	Hours/Week L T P		Credit	Maximum
Code	(Course Name	L			L T P	
22MT34801	PROJECT V	WORK (PHASE -2)	0	0	12	6	100
Objective(s)	training in	objective is to give an o the fabrication of one ich is designed by them	or more c				
Outcome(s)	At the end of the course, the student should be able to:						
	GUIDE	LINE FOR REVIEW	AND EV	ALU	ATIO	N	

- The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor andif possible with an industry.
- A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department.
- At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total hours to be taught

60 Periods

Br. T.JESUDAS, M.E., Ph.D Professor and Head Department of Mechatronics Mahendra Enginoering College Mallasamudram, Namakkal

PROFESSIONAL ELECTIVES



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Department	Mechatronics Programme Code & Name									
Course code	Course Name	Hours/week Credit			Hours/week Credit					
22MT15001	SENSORS AND SIGNAL PROCESSING	L	T	100						
Objective(s)		and the methods of processing								
Outcome(s)	Temperature, Displacement, sensors. 2. Design signal conditioning cir. 3. Understand applications of variables.	 Understand principle of working of various signal conditioners used with Temperature, Displacement, Optical and various miscellaneous other sensors. Design signal conditioning circuits for various transducers. Understand applications of various signal conditioners used in industry. 								
UNIT-I	SCIENCE OF MEASUREMENT					(9)				
						` '				
System – Static and First Order transducers.	ards – Calibration techniques –Errors ir and dynamic characteristics of transductors to discourse to discours	ers – G ifferent	enerali	ized Po	erformance	Measurement e of Zero Order Classification of				
System – Static and First Order transducers. UNIT-II	and dynamic characteristics of transduc Systems - Response of transducers to di MECHANICAL MEASUREMENT	eers – G fferent FS	enerali time v	ized Po arying	erformance inputs – C	Measurement e of Zero Order Classification of (9)				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge	and dynamic characteristics of transduc Systems - Response of transducers to di	eers – Gafferent TS Dometer IcLeod	enerali time v – mon gauge	arying omete , ther	erformance inputs – C rs – elasti nal condu	Measurement e of Zero Order Classification of (9) ic transducers – ctivity gauge –				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge	and dynamic characteristics of transductors of transducers to discovere the systems - Response of transducers to discovere the systems - Bimetallic thermodelile - Billows - diaphragm. Vacuum: Marchand - Marchand - Billows - diaphragm.	eers – Gafferent TS Dometer IcLeod	enerali time v – mon gauge	arying omete , ther	erformance inputs – C rs – elasti nal condu	Measurement e of Zero Order Classification of (9) ic transducers – ctivity gauge –				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge anemometer.' UNIT-III Resistive transd displacement, te	and dynamic characteristics of transductors are systems - Response of transducers to disconnect the systems - Response of transducers to disconnect the systems - Bimetallic thermore, and the systems - Bimetallic thermore, and the systems - Bimetallic thermore, flow measurement: orifice, venture, in the systems of transducers and transducers are systems.	rers – G Ifferent TS Dimeter IcLeod Ozzle, p tor – Tl ive trar	eneralitime v - mon gauge bilot tu nermocusducer	omete, therebe, tur	erformance inputs – C rs – elastinal condubine flow incomplete in the conduction of	Measurement e of Zero Order Classification of (9) ic transducers – ictivity gauge – meter, hot wire (9) auges – use in OT – use in				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge anemometer.' UNIT-III Resistive transd displacement, te	mechanical measurement - Bimetallic thermometer - Bimetallic thermometer - Bimetallic thermometer, flow measurement: orifice, venture, notes - Potentiometer - RTD - Thermis mperature, force measurement - Induction	rers – G Ifferent TS Dimeter IcLeod Ozzle, p tor – Tl ive trar	eneralitime v - mon gauge bilot tu nermocusducer	omete, therebe, tur	erformance inputs – C rs – elastinal condubine flow incomplete in the conduction of	Measurement e of Zero Order Classification of (9) ic transducers – ictivity gauge – meter, hot wire (9) auges – use in OT – use in				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge anemometer.' UNIT-III Resistive transd displacement, tedisplacement – UNIT-IV Radiation Senso	and dynamic characteristics of transductors are systems - Response of transducers to discovere the systems - Response of transducers to discovere the systems - Response of transducers to discovere the systems - Bimetallic thermore - Bimetalli	rs – G Ifferent rs Ometer IcLeod Ozzle, p tor – Th ive trar ansduce	mermocasducer – Di	omete, then be, tur	rs – elastinal condubine flow	Measurement e of Zero Order Classification of (9) ic transducers – ictivity gauge – meter, hot wire (9) auges – use in OT – use in int transducers. (9) ons - Automobile				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge anemometer.' UNIT-III Resistive transd displacement, tedisplacement – UNIT-IV Radiation Senso	MECHANICAL MEASUREMENT illed thermometer — Bimetallic thermometer — bellows — diaphragm. Vacuum: Metallic measurement: orifice, venture, note that is a proper to the measurement in the measurement orifice, venture, note that is a proper to the measurement — Induct capacitive transducer — Piezo electric transducer — Piezo electric transducer — Smart Sensors — Film sensor, MEM	rers – G ifferent rs ometer IcLeod ozzle, p tor – Tl ive trar ansduce s & Na diagnos	eneralitime v - mon gauge pilot tu nermoc asducer er – Di ano Ser tics, E	omete , therr be, tur ouple - LV gital d	erformance inputs – C rs – elastimal conduition flow in the conduit	Measurement e of Zero Order Classification of (9) ic transducers – ictivity gauge – meter, hot wire (9) auges – use in OT – use in int transducers. (9) ons - Automobile				
System – Static and First Order transducers. UNIT-II Temperature: F bourdon gauge Ionization gauge anemometer.' UNIT-III Resistive transd displacement, te displacement – UNIT-IV Radiation Senso Aerospace, Hon UNIT-V Amplification –	and dynamic characteristics of transductors are systems - Response of transducers to discovere the systems - Response of transducers to discovere the systems - Response of transducers to discovere the systems - Bimetallic thermore - Bimetallic thermore - Bellows - diaphragm. Vacuum: March - Bellows - diaphragm. Vacuum: March - Systems - Potentiometer - RTD - Thermis - Potentiometer - RTD - Thermis - Potentiometer - RTD - Thermis - Potentiometer - Piezo electric transducer -	rers – G ifferent rs ometer IcLeod ozzle, p tor – Tl ive transduct s & Na diagnos DATA	eneralitime v - mon gauge pilot tu nermoc asducer er - Di uno Ser tics, E	comete comete therebe, therebe, ture ouple - LV gital densors - nviron	erformance inputs – Constant conduction of the c	Measurement e of Zero Order Classification of (9) ic transducers – activity gauge – meter, hot wire (9) auges – use in OT – use in nt transducers. (9) ons - Automobile onitoring. (9)				

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TEX	T BOOKS:
1	Doebelin. E. O., "Measurement Systems – Applications and Design", Tata McGraw Hill, 1992
2	Patranabis. D, "Sensors and Transducers", 2nd Edition PHI, New Delhi, 2003.
REF	ERENCE:
1	Ian SinclaIr .R "Sensors and transducers", Newnes ,Elaiver Indian print 2011.
2	Beckwith, Marangoni and Lienhard, "Mechanical Measurements", Addison Wesley, 2000.
3	Venkatesan. S.P, "Mechanical Measurements", Ane Books Pvt Ltd, India 2008.



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lahendhirapuri, Mallasamudram (W), Namakkal (Dt) - 637 503, Tamil Nadu 04288-288 500 / 521 / 522 | www.mahendra.info **Programme Department MECHATRONICS** 1101 & MCT Code & Name Maximum Hours/week Course code **Course Name** Credit marks L T P \mathbf{C} 22MT15002 **COMPUTER AIDED DESIGN** 100 3 0 0 3 To provide an overview of how computers are being used in mechanical component design. To learn the basic curves and modeling techniques. To know several techniques for removing hidden lines and surfaces. Objective(s) Use CAD software to generate a computer model and technical calculations for a simple, well-defined part or assembly. To know how the standards drawings are created and documented in CAD. The students will be able to 1. Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics. Explain the fundamentals of parametric curves, surfaces and Solids.

Outcome(s)

- 3. Able to add realism to pictures by eliminating hidden lines and surfaces on solid objects.
- 4. Generate and interpret engineering technical drawings of parts and assemblies according to engineering design standards.
- 5. Summarize the different types of Standard systems used in CAD.

UNIT-I FUNDAMENTALS OF COMPUTER GRAPHICS

(9)

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation.

UNIT-II GEOMETRIC MODELING

(9)

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep.

UNIT-III VISUAL REALISM

(9)

Hidden – Line-Surface-Solid removal algorithms – shading – colouring – computer animation.

UNIT-IV ASSEMBLY OF PARTS

(9)

Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property Calculations – mechanism simulation and interference checking.

UNIT-V CAD STANDARDS

(9)

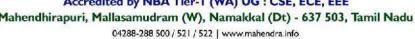
Standards for computer graphics- **Graphical Kernel System** (GKS) - standards for exchange images-**Open G**raphics Library (**OpenGL**) - Data exchange standards - IGES, STEP, CALS etc. -Communication standards.

Total hours to be taught

45 Periods



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TEXT BOOK:

1 Ibrahim Zeid "Mastering CAD CAM" Tata McGraw-Hill Publishing Co.2007.

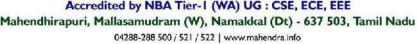
REFERENCES:

- 1 Chris McMahon and Jimmie Browne "CAD/CAM Principles", "Practice and Manufacturing management "Second Edition, Pearson Education, 1999.
- William M Neumann and Robert F.Sproul "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.
- 3 Donald Hearn and M. Pauline Baker "Computer Graphics". Prentice Hall, Inc, 1992.
- Foley, Wan Dam, Feiner and Hughes "Computer graphics principles & practice" Pearson Education 2003.



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Department	Mechatronics	Prog	ramme	e Code	110	01 & MCT		
Course code	Course Name	Н	Hours/week			Maximum marks		
22MT15003	MICRO ELECTRO	L	T	P	C	100		
2211113003	MECHANICALSYSTEMS	3	0	0	3	100		
Objective(s)	 To know basic knowledge about MEMS system. To study about micro sensors and actuators. To study about fabrication process. To design micro systems. To study the material of MEMS system. 							
	The students should be able to		•					
	1. List the different scaling laws			•	n design.			
Outcome(s)	2. Know the basic knowledge ab		•		•			
Outcome(s)	3. Describe the various working					micro actuators.		
	4. Summarize various micro syst	em 1ab	ricatioi	n tecnn	iques.			
UNIT-I	5. Design the micro system. INTRODUCTION					(0)		
		a and '	Tuonad	1100#0	Consons	(9)		
	teristics of MEMS – Energy Domain Micro fabrication - Silicon based MEI							
	echanical concepts in MEMS – Semico							
	ending- Torsional deflection.							
UNIT-II	MICRO SENSORS AND ACTUAT	ORS				(9)		
	le of Microsystems - micro actuation te s – micro pump – micro motors – micro							
UNIT-III	SENSORS AND ACTUATORS-I					(9)		
Piezoresistive sensors – Piezo resistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia, Acoustic, Tactile and Flow sensors.								
UNIT-IV	MICRO SYSTEM DESIGN					(9)		
_	ations-process design-mask layout designotive industry, bio medical, aerospace a	-		_		ions of micro		
UNIT-V	POLYMER AND OPTICAL MEM	S				(9)		
Parylene –Fluor	EMS— Polyimide - SU-8 - Liquid Crystocarbon - Application to Acceleration, and Mirrors — Actuators for Active Open	Pressu	re, Flo					
MIDNID — Delises	Total hours t		1		45 I	Periods		

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TEX	T BOOKS:
1	Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2	Stephen D Senturia, 'Micro system Design', Springer Publication, 2000.
3	Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
REF	ERENCES:
1	NadimMaluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2	Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC presBaco Raton, 2001.
3	Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.



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Department	Mechatronics	Programme Code & Name			110)1 & MCT		
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks		
22MT15004	MACHINE VISION AND IMAGE PROCESSING	L T P		_	C	100		
	IMAGE I ROCESSING	3	0	0	3			
Objective(s)	 To get exposed to simple ima Frequencydomain. To learn concepts of degradat To study the image segmentat To become familiar with image 	Frequencydomain. • To learn concepts of degradation function and restoration techniques.						
Outcome(s)	On the successful completion of the course, students will be able to 1. Know the basics of digital image processing. 2. Understand the fundamentals of digitization, sampling, quantization, and 2D-transforms. 3. Operate on images using the techniques of smoothing, sharpening and enhancement. 4. Understand the restoration concepts and filtering techniques. 5. Learn the basics of segmentation, features extraction, compression and recognitionmethods for color models.							
UNIT-I	DIGITAL IMAGE FUNDAMENT					(9)		

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms -DFT, DCT.

UNIT-II IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform-Smoothing and Sharpening frequency domain filters - Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

IMAGE RESTORATION

Image Restoration - degradation model, Properties, Noise models - Mean Filters - Order Statistics -Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering –Wiener filtering.

UNIT-IV **IMAGE SEGMENTATION**

 $\overline{(9)}$

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds - basic concepts - Dam construction - Watershed segmentation algorithm.



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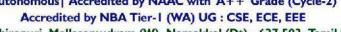
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UNIT	Γ-V	IMAGE COMPRESSION AND RECOGNITION	ON	(9)			
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG							
standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional							
Desci match		pological feature, Texture - Patterns and Pattern class	sses - Recognition based	on			
	Total hours to be taught 45 Periods						
TEX'	T BOOKS:						
1	Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Third Edition, 2010.						
2	Anil K. Ja	in, 'Fundamentals of Digital Image Processing', Pea	arson, 2002.				
REF	ERENCE:						
1	Kenneth R	d. Castleman, 'Digital Image Processing', Pearson, 2	2006.				
2	Rafael C. Gonzalez, Richard F. Woods, Steven Eddins, 'Digital Image Processing using						
3	D.F. Dudgeon and RM. Mercereau, 'Multidimensional Digital Signal Processing'						
4	William K	. Pratt, 'Digital Image Processing', John Wiley, Ne	w York, 2002.				
5	Milan Sonka et al 'Imaga processing analysis and machine vision' Brookes/Cola Vikas						

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Department	Mechatronics	Programme Code			11	01 & MCT	
						Maximum	
Course code	Course Name	Н	ours/w	eek	Credit	marks	
223 4751 500 5	A DEVELOUAL INVESTIGATION	L	T	P	C	100	
22MT15005	ARTIFICIAL INTELLIGENCE	3	0	0	3	100	
	To acquire knowledge about di			ning te	chniques a	and algorithms.	
	To train the system in playing :	_			1.0		
Objective(s)	To Study the concept of repr	esentır	ig kno	wledge	and fact	s using	
Objective(s)	reasoning and structures.			4-4:		41	
	To study the concept of structure To study the concept of structure	_	-		_	_	
	 To study the concept of structu Student should be able to 	iai Kii	owieug	e repre	semanon.	•	
	1. Explain the characteristics of	f AI sy	stems	with di	fferent se	arching	
	techniques andalgorithms.		Stellis	With G		ar ching	
Outcome(s)	2. Develop algorithms to train	the svs	stem in	plavin	g games.		
	3. Summarize the concepts of	_		-			
	4. Design a simple AI System.			•			
	5. Understand the concept of structural knowledge representation.						
UNIT I	INTRODUCTION					(9)	
	ttern recognition – Criteria of success						
	h – Problem Characteristics – Produc		-			 Forward and 	
UNIT II	ning – Matching Indexing – Heuristic F GAME PLAYING	uncuo	ns, sea	irch aig	goriunns.	(9)	
	i i	Dat	o autof	Fo 137.	aitina fan	` ,	
	nimax search procedure – Adding Alpha h – Using book moves.	ı – Bei	a Cutor	IS — W	alung for	Outescence –	
UNIT III	KNOWLEDGE REPRESENTATI	ON U	SING	CONV	ENTION	IAL (9)	
	LOGICS						
	e logic – Introduction to representation						
_	representation – resolution – Conversional Igorithm – Question answering – Natura			om – 1	ne basis	of resolution	
Offication of a	ilgorium –Question answering – Natura	ıı Deui	iction.				
UNIT IV	KNOWLEDGE REPRESENTATI	ON U	SING 1	MODE	ERN LOC	GICS (9)	
	reasoning – Statistical Probabilistic rea		y – Tec	hnique	s for deal	ing with a	
random worlda	nd deterministic world – rule-based syst	em.					
UNIT V	STRUCTURAL REPRESENTATI	ONS	OF KN	OWL	EDGE	(9)	
	vledge structures - level of represe			_			
representations – Semantic nets – Conceptual dependency Frames Scripts – Procedural							
Systems.	representation – Natural language understanding – Perception – learning – Implementation A.I.						
Systems.	TOTA	L HO	JRS		45 F	Periods	
					4 3 I	CHOUS	

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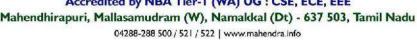


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TEX'	T BOOKS:
1.	Elaine Rich, "Artificial Intelligence", McGraw-Hill Book Co., 2009
2.	M. W. Richaugh, "Artificial Intelligence, A. Knowledge Based Approach", PWS Rent Publishing Boston, 1998
REF	ERENCE:
1.	Charniac. E and M.C.Dermott. "Introduction to Artificial Intelligence", Addison Wesley Publishing Company, 2002
2.	Robert Goodell Brown, "Materials Management Systems – A Members Library", John Wiley Publishers, 1977.
3.	Westing Fine and Zone, "Purchasing Management Principles", John Wiley Publishers, 1986.



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Department	Mechatronics	Programme Code & Name 1101 & MCT						
		Cot	16 CC 11	ame				
Course code	Course Name	Н	ours/w	Maximum Marks				
22MT15006	ENGINEERING ECONOMICS AND COST ANALYSIS	L 3	T 0	100				
Objective(s)	Basics of economic analysis and cost analysis are introduced.							
Outcome(s)	 The students will be able to based on depreciation, money products in their management 	⁄ availa	able, su					
UNIT-I	DEMAND AND SUPPLY ANALYS					(9)		
analysis in busin	ee of engineering economics – definition ness. Demand and supply analysis – dem mandforecasting. Law of supply – elastic	and de	termin	ants- I	Law of de			
UNIT-II	COST ANALYSIS					(9)		
Pricingdecision	Fixed cost, variable cost, marginal cost s – situations demanding pricing decisional cost pricing, going rate pricing, bid pricing MONEY AND BANKING	ons, pri	cing te	echniqu	ues in pra	ctice – full cost		
		. 11	1 1	• • •	.•			
	 inflation – deflation, banking- commer economic environment – globalization, l 					ı .		
UNIT-IV	CAPITAL BUDGETING					(9)		
Ned for capital budgeting – method of apprising project profitability – rate of return method, payback periodmethod, present value comparisons method, cost benefit analysis. Preparation of feasibility report, appraisal process, economic and commercial feasibility, financial feasibility, technical feasibility.								
UNIT-V	DEPRECIATION AND COST ANA	ALYSI	S			(9)		
Causes of depreciation, objectives, methods of computing depreciation, simple problems. Breakeven analysis, breakeven point – assumptions, breakeven chart, uses of breakeven analysis, simple problems. Financial statements – cash flow statement, profit and loss account, balance sheet and evaluation of projected financial statements.								
Total hours to be taught 45 Periods TEXT BOOKS:								
		Econo	mics" '	Tata N	/IcGraw H	il. 1998.		
James L Rigs, David D. Bedworth, "Engineering Economics", Tata McGraw Hil, 1998. Chandrasekar. K.S., "Marketing Management Text and Cases", 1st Edition Tata McGraw Hill – Vijaynicole, 2010.								



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REF	REFERENCE:					
1	Varshney R and Maheswari K L, "Managerial Economics", S.Chand & Co, 1993					
2	Samuelson P A and Nordhaus W D, "Economics", Tata McGraw Hill, 2001.					
3	Prasanna Chandra, "Projects", Tata McGraw Hill, 2003.					
4	Patel Bhavesh. M, "Project Management, Strategic Financial Planing Evaluation and Control", Vikas Publishing House, New Delhi, 2000.					

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	partment Mechatronics Programme Code & Name				101 & MCT	
Course code	Course Name	Но	ours/w	eek	Credit	Maximum marks
22MT15007	ENGINEERING MATERIALS AND METALLURGY	L 3	T 0	P 0	C 3	100
• To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.						
UNIT-I	CONSTITUTION OF ALLOYS AN	ND PHA	ASE D	IAGR	AMS	(9)
Classification of s	c, peritectic, and peritectroid reaction steel and cast Iron, microstructure, properties at TIME ATMENT.				-	
UNIT-II	HEAT TREATMENT annealing, stress relief, re-crystallization					(9)
UNIT-III Mechanism of pla tension, compress Izod and Charpy,	mECHANICAL PROPERTIES AN astic deformation, slip and twinning – To and shear loads – Hardness tests (E Fatigue and creep tests, fracture toughn	ypes of Brinell, less test	TING fractu Vicker s.	re – To	esting of 1	(9) materials under), Impact test -
UNIT-IV	FERROUS AND NON FERROUS I					(9)
maraging steels –	elements on steel (M _n , Si, Cr, Mo, V, Cast Irons - Grey, White malleable, Sp s - Brass, Bronze and Cupronickel – ng alloys. NON-METALLIC MATERIALS	heroida	ıl – Gra	aphite,	Alloy cas	t irons, Copper
• • • •	of polymer, commodity and engineering, PMMA, PET, PC, PA, ABS, PI, PAI	- 1		_		* *
and Phenol Forma	aldehydes – Engineering Ceramics – Int			Fiber re		
	Total hours t	o be tau	ight		45 PEF	RIODS
TEXT BOOK:			'			
	Budinski and Michael K.Budinski "Ennited, 4th Indian Reprint 2002.	gineerii	ng Mat	erials'	Prentice-	Hall of India
REFERENCES:						
1 William D	Callister "Material Science and Engine	ering",	John V	Viley a	and Sons 2	007.

- 2 Raghavan. V "Materials Science and Engineering", Prentice Hall of India Pvt., Ltd., 2007.
- 3 Sydney H.Avner "Introduction to Physical Metallurgy" McGraw Hill Book Company, 2007.
- 4 Dieter G. E., Mechanical Metallurgy, Mc Graw Hill Book Company, 1988.
- 5 O.P. Khanna, A text book of Materials Science and Metallurgy, Khanna Publishers, 2003.

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Course code	Course Name	I	Hours/v	veek	Credit	Maximum marks		
22MT15008	PRODUCT DESIGN AND DEVELOPMENT	L 3	T 0	P 0	C 3	10 0		
Objective(s)	 To study the basic concepts of product design and development process. To study the key reasons for design or redesign. To study the applicability of product design and development for different applications. To know the rules and principles for manufacturing and assembling of a new product. Undertake a methodical approach to the management of product development to 							
Outcome(s)	 satisfycustomer needs. The students will be able to Select an appropriate product design and development process for a given application. Define the components and their functions of product design and development processes andtheir relationships from concept to customer over whole product lifecycle. Analyze, evaluate and apply the methodologies for product design and development. Apply design rules for material selection, design for manufacturability and design forassembly. 							
UNIT-I	Recognize issues of product safetNEW PRODUCT DEVELOPMENT	•				(9)		
Collaborative pro	oment – Trends– Best practices– Product development – Time compressi ment.Conceptual / Industrial / Engineer CONCEPTUAL DESIGN	on Tec	hnologi	es – ri	sk manage	ement – Stages of		
and utility metric	Early design – Customer needs – Requirement Definition and Conceptual design – Optimization using cost and utility metrics – Trade-off analysis- models and parameters design to cost – Design to Life cycle cost – Design for warranties-problem solving – Benchmarking.							
	Analysis and modeling Rest p		for do	tailed	dacion 1	(9)		
Prototypes in de	 Analysis and modeling – Best protailed design – Test and Evaluation acturing – Strategies – planning and me 	- Des	ign rev					
UNIT-IV	DESIGN FOR MANUFACTURE A			LY		(9)		
process capabilit	General design principles for manufacturability – strength and mechanical factors, mechanism selection-process capability – Feature tolerances – Geometric tolerances – Assembly limits – Datum features – Tolerance stacks – Problems on tolerancing – Exposure on DFMA software.							

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U	NIT-V DESIGN FOR UNKNOWN	(9)					
Simp	Simplification - commonality and preferred methods - Modularity and scalability - part reduction -						
	functional analysis and value engineering – Reliability – Strategies and practices – Testability – Design for						
	test and inspection. Design for people - Ergonomics, Reparability, Maintainability, safety and product						
liabil							
	Total hours to be taught 45 Perio	ods					
TEX	T BOOK:						
1.	1. Karl T. Ulrich and Steven D. Eppinger. "Product Design and Development" Tata McGraw-Hill PublishingCompany Limited, 2003						
REF	ERENCES:						
1.	Stephen C. Armstrong, "Engineering and Product development Management– The Holostic Approach" Cambridge University Press, 2001.						
2.	Ibrahim Zeid, "Mastering CAD/CAM" Tata McGraw-Hill, 2005.						
3.	Corrodo Poli, "Design for Manufacturing: A structured approach", Butterworth- Heinen	nann, 2001.					
4.	John W. Priest and Jose M. Sanchez, "Product development and design for manufacturic collaborative approach to Produciability and reliability", Marcel Dekker Publications, 20						



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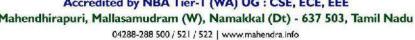
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Department	Mechatronics	Programme Code & Name			110	1 & MCT	
Course code	Course Name	Но	ours/w	Maximum Marks			
22MT15009	SAFETY ENGINEERING	L 3	T 0	P 0	C 3	100	
 To impart knowledge on safety engineering fundamentals and safety management practices. To demonstrate knowledge of hazards associated with chemical To know the safety procedures and obligations that applies to their workplace environment and the guidelines for safety regulations. To achieve maximum safety by minimizing, eliminating, or establishing control over significant risks. 							
Outcome(s)	The students will be able to 1. Assess the severity of the consequences of incidents. 2. Undertake a Hazard and Operability Study. 3. Explain the legal framework controlling process plant safety in industrialized						
UNIT-I	INTRODUCTION					(9)	
Evolution of mo Vessels, Electrica	dern safety concepts – Fire preventional Exposure.	n – Me	chanic	al haz	ards – Bo	ilers, Pressure	
UNIT-II	CHEMICAL HAZARDS					(9)	
Chemical exposu Hygiene – Indust	rial Toxic materials – Ionizing Radiat rial Toxicology.	ion and	l Non-	ionizir	ng Radiatio	on – Industrial	
UNIT-III	ENVIRONMENTAL CONTROL					(9)	
	Hazards – Environmental Control – Ind Vibration, - Personal Protection.	lustrial	Noise	- Nois	e measurir	ng instruments,	
UNIT-IV	HAZARD ANALYSIS					(9)	
	nalysis –Techniques – Fault Tree Analy P analysis and Risk Assessment.	sis (F7	(A), Fa	ailure I	Modes and	EffectsAnalysis	
UNIT-V	SAFETY REGULATIONS					(9)	
_	aster management – catastrophe control afety regulations Product safety – case s			ol, Sa	fety educa	tion andtraining	
	Total hours t	o be tai	ıght		45 Pe	riods	
TEXT BOOK:							
1 John V.Gr	imaldi, "Safety Management", AITB S	Publish	ers, 20	003.			

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REFERENCES:

1 Safety Manual, "EDEL Engineering Consultancy", 2000.

David L.Goetsch, "Occupational Safety and Health for Technologists", 5th Edition, Engineers

and Managers, Pearson Education Ltd., 2005.



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Department	Mechatronics	Programme Code & Name				1 & MCT			
Course code	Course Name	Н	ours/w	Maximum Marks					
22MT15010	POWER ELECTRONICS	L 3				100			
Objective(s)	 To get an overview of different types of power semiconductor devices and theirswitching characteristics. To understand the operation, characteristics and performance parameters of controlled rectifiers. To study the operation, switching techniques and basics topologies of DC-DCswitching regulators. To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods. To study the operation of AC voltage controller and various configurations. 								
Outcome(s)	The students will be able to 1. Realize the Characteristics of Power Semiconductor Devices. 2. Investigate and design the power converter circuits for AC-DC. 3. Analyze the DC-DC converter circuits for real time application. 4. Capability to design the inverter circuits. 5. Examine voltage controllers.								
UNIT-I	POWER SEMI-CONDUCTOR DE	EVICES	5			(9)			
_	teristics of switching devices, Diode, Sinic characteristics - Triggering and condit.								
UNIT-II	AC-DC CONVERTERS					(9)			
Controlled and u	ancontrolled rectifiers (single phase and rectifiers.	d three	phase)	– pow	ver factor, l	narmonics –			
UNIT-III	NIT-III DC-DC CONVERTERS (9)								
converter, boost	inear mode power conversion – switc converter, buck-boost converter, Cuk ick converter –Introduction to resonant	convert	er - Iso						
UNIT-IV	DC-AC CONVERTERS					(9)			
Introduction - voltage source inverter - current source inverter - square wave and PWM inverters (single phaseand three-phase) – PWM techniques.									
UNIT-V	AC TO AC CONVERTERS (9)								
	d Three phase AC voltage controllers nce control – single phase and three phase	ase cycl	o conv						
	Total hours t	to be tau	ıght		45 Pc	eriods			

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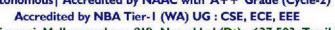
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TEX	T BOOKS:			
1	Muhammad H.Rashid, 'Power Electronics: Circuits, Devices and Applications', Prentice Hall			
1	of India, Pearson Education, 4th Edition, 2013.			
2	P.S.Bimbra, 'Power Electronics', Khanna Publishers, 5 th Edition, 2012.			
3	L. Umanand, 'Power Electronics Essentials and Applications', Wiley, 2010.			
REFERENCE:				
1	Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th			
1	Reprint,2013.			
2	Ashfaq Ahmed, 'Power Electronics for Technology Pearson Education', Indian reprint, 2003.			
3	Philip T. Krein, 'Elements of Power Electronic', Oxford University Press, 2004 Edition.			
4	Ned Mohan, Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters,			
4	Applications and Design ', John Wiley and sons, third edition, 2003.			
5	M.D. Singh and K.B. Khanchandani, 'Power Electronics', Mc Graw Hill India, 2013.			



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Department	MECHATRONICS	Programme Code & Name			11	01 & MCT		
Course code	Course Name	Н	ours/we	eek	Credit	Maximum marks		
22MT15011	SMART MANUFACTURING	L 3	T 0	P 0	C 3	100		
Objective(s)	 To Learn about Internet of Things (IoT). To provide a depth knowledge of Smart Manufacturing. To address the underlying concepts and methods behind Smart Manufacturing. 							
Outcome(s)	On successful completion of the course, the students will be able to • Analyze the power of Cloud Computing in a networked economy • Identify different areas of IOT and Smart Manufacturing. • Outline the various systems used in a manufacturing plant and their role in a smart Manufacturing. • Predict the smartness in Smart Factories, Smart cities, smart products and smart services. • Find how organizations and knowledge workers can be better prepared to reap the benefits of this latest revolution.							
UNIT-I	THE INTERNET OF THINGS					(9)		
in a Cloud World in the Cloud.	sign Principles for Connected Devices; Int — Introduction to Cloud, Relational Databa	ses in t	he Clou	ıd, Auto		rage Management		
UNIT-II	INTRODUCTION TO SMART MANU					(9)		
Smart Manufactu Dynamically Opti	ing – Definition, components, Smart Manuring Processes - Three Dimensions: Demized Manufacturing Enterprises (plant + ment (intelligent energy demand management)	emand - enterp	Driven orise op	and I	ntegrated s) - Real '	Supply Chains - Fime, Sustainable		
UNIT-III	SMART DESIGN/FABRICATION					(9)		
Smart Design/Fab Agile (Additive) M	rication - Digital Tools, Product Represent Manufacturing Systems and Standards. Mas (perception, manipulation, mobility, auton	ss Custo	omizatio	on, Sma	art Machin	es and Standards, e Tools, Robotics		

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(9)

Online Predictive Modeling, Monitoring and Intelligent Control of Machining/Manufacturing and Logistics/Supply Chain Processes; Smart Energy Management of manufacturing processes and facilities.

SMART APPLICATIONS

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UNIT	SMART AND EMPOWERED WORKERS	(9)						
Elimi	Eliminating Errors and Omissions, Deskilling Operations, Improving Speed/Agility, Improving Information							
Captu	Capture/Traceability, Improving Intelligent Decision Making under uncertainty Assisted/Augmented							
Produ	Production, Assisted/Augmented Assembly, Assisted/Augmented Quality, Assisted/Augmented Maintenance,							
Assist	Assisted/Augmented Warehouse Operations and Assisted Training.							
	Total hours to be taught 45 Periods							
TEX	Г ВООК:							
1	A. McEwen and H. Cassimally, Designing the Internet of Things, 1st edition, Wiley, 2013, ISE	3N-10:						
1	¹ 111843062X.							
REFERENCE:								
1	N. Vengurlekar and P. Bagal, Database Cloud Storage: The Essential Guide to Oracle Automatic							
1	Storage Management, 1st edition, McGraw-Hill Education, 2013.							
2	M. Kuniavsky, Smart Things: Ubiquitous Computing User Experience Design, 1st edition	, Morgan						
2	Kaufmann, 2010.							



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Department	Mechatronics	Programme Code		2	1101 &		МСТ	
Course code	e Course Hours/week Credit					N	Maximum marks	
22MT15012	DESIGN OF	L	T	P	С		100	
	MECHATRONICS SYSTEM	3	0	0	3			
Objective(s)	 To study basic design parameters of mechatronics system. To understand and design the mechatronics model and simulation. To know the real time interfacing for data transfer. To study the calibration and working of mechatronics system. To know the various application of mechatronics system. 							
Outcome(s)	 Student will be able to Design parameters of mechatronics system. Understand and design the mechatronics model and simulation. Know the real time interfacing for data transfer. Study the calibration and working of mechatronics system. Know the various application of mechatronics system. 							
UNIT-I	INTRODUCTION TO MECHATRO	NICS S	SYSTI	EM			(9)	
designs –Adva UNIT-II Introduction –	 Mechatronics Design process –Design anced approaches in Mechatronics - Industry SYSTEM MODELLING model categories – fields of application ion – model simplification – Simulators and simulators a	strial de on – mo	esign ar	nd erg	onomics, sa	fety.	(9)	
UNIT-III	REAL TIME INTERFACING						(9)	
Over view of 1	selection of interfacing standards – Elendo Frocess, General purpose I/O card and oftware - Lab view Environment and in	nd its in	nstallat	ion –	Data conve	rsion	process -	
UNIT-IV	CASE STUDIES ON MECHATRON	IC SYS	STEM				(9)	
- Straingauge	sportation surface materials – Transduce weighing system – Solenoid force-displace rolling temperature of hot/cold reservoir.	cement		•			* *	
UNIT-V	CASE STUDIES: DATA ACQUISIT	ION A	ND CO	ONTR	OL	1	(9)	
		era – Pi	ck and		robot – Car	park	barrier –	
	Total hours	to be tai	ught		Projest Del Sthek Mahendra E Mallasami	name	ochatronics ering Colleg , Namakka)	

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TEX	T BOOKS:
1	Devdasshetty, Richard A. Kolk, "Mechatronics System Design", 2nd Edition, Cengage Learning
	2011.
2	Georg pelz, "Mechatronic Systems: Modeling and simulation" with HDL's, John wiley and
	sonsLtd,2003.
REF	ERENCE:
1	Bishop, Robert H, "Mechatronics Hand book", CRC Press, 2002.
2	Bradley, D.Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in
	Products and Processes", CRC Press 1991, First Indian print 2010.



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Department	Mechatronics	Programme Code & Name				01 & MCT				
Course code	Course Name	Н	ours/w	Maximum Marks						
22MT15013	INDUSTRIAL ELCTRONICS ANDAPPLICATIONS	L T P C 3 0 0 3				100				
Objective(s)	• Students will be exposed to industrial environment.	electron	ics de	vices	es and their controls used in					
Outcome(s)	tcome(s) The students will be able to design various electronic industrial controllers.									
UNIT-I	INTRODUCTION					(9)				
	ol classification- motion and process c nal Amplifier-review of thyristor- SCR					nterfacing				
UNIT-II	CONVERTERS AND INVERTER	S				(9)				
•	rolled and fully controlled converters-lee- current source and series converters		nverte	ers-Ana	alysis of vo	oltage source				
UNIT-III	INDUSTRIAL MOTOR CONTRO	L				(9)				
	olling speed- Basic control circuit-DC motor control- micro controller-based motor control.									
UNIT-IV										
relays-Induction	heating- dielectric heating- resistance	welding		te rela	ys- Latchi					
UNIT-V	PROCESS AND MOTION CONTI	ROL				(9)				
	cess control- temperature control- Flo control- Direct digital control.	w contr	ol- Le	evel co	ontrol- Met	hods of motion				
Total hours to be taught 45 Periods										
TEXT BOOK:										
	.S "Industrial Electronics "Technical	Publica	tions ,	2009.						
REFERENCE: 1 Terry Bal	telt, "Industrial electronics, devices, sys	tems ar	nd anni	lication	ns" Delma	r nuhlishers				
	Herman, Walter N.Alerich, "Industri									
3 Biswanath	Biswanath Paul, "Industrial Electronics and Control" Prentice Hall India publisher – 2004.									
4 P.Harrott-	"Process Control"- Tata McGraw Hill-	-1991.								



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Department	Mechatronics	Programme Code & Name			e 1101 & MCT			
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks		
22MT15014	EMBEDDED SYSTEM DESIGN	L 3	T	P 0	C 3	100		
Objective(s)	 The student should be able to Provide knowledge on the basics, building blocks of Embedded System. Discuss Input/output Interfacing & Bus Communication with processors. Teach automation using scheduling algorithms and Real time operating system. Design and model the hardware / software approach. 							
Outcomes	 Discuss on different Phases & Modeling of a new embedded product. On the successful completion of the course, students will be 1. Illustrate the basic concepts of Embedded Systems. 2. Describe the devices and buses used in embedded networking. 3. Explain the processor scheduling algorithms. 4. Determine the embedded hardware and software development cycles and tools. 5. Develop programming skills in embedded systems for various applications. 							
UNIT-I	INTRODUCTION TO EMBEDDED SYSTEMS (9)							

Introduction to Embedded Systems –built in features for embedded Target Architecture - selection of Embedded processor – DMA- memory devices – Memory management methods-memory mapping, cache replacement policies- Timer and Counting devices, Watchdog Timer, Real Time Clock-Software Development tools-IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging- Overview of functional safety standards for embedded systems.

UNIT-II EMBEDDED NETWORKING BY PROCESSORS

(9)

Embedded Networking: Introduction, I/O Device Ports & Buses- multiple interrupts and interrupt service mechanism – Serial Bus communication protocols -RS232 standard–RS485–USB–Inter Integrated Circuits (I2C)- CAN Bus –Wireless protocol based on Wifi , Bluetooth, Zigbee – Introduction to Device Drivers.

UNIT-III RTOS BASED EMBEDDED SYSTEM DESIGN

(9)

Introduction to basic concepts of RTOS- Need, Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-context switching, interrupt latency and deadline shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: VxWorks, uC/OS-II, RT Linux.

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UNIT-IV	MODELLING WITH HARDWARE/SOFTWARE DESIGN	(9)
	APPROACHES	

Modeling embedded systems- embedded software development approach --Overview of UML modeling with UML, UML Diagrams-- Hardware/Software Partitioning, Co-Design Approaches for System Specification and modeling- Co Synthesis- features comparing Single-processor Architectures & Multi-Processor Architectures--design approach on parallelism in uniprocessors & Multiprocessors.

UNIT-V	EMBEDDED SYSTEM APPLICATION DEVELOPMENT	(9)

Objective, Need, different Phases & Modeling of the EDLC, choice of Target Architectures for Embedded Application Development-for Control Dominated-Data Dominated Systems-Case studies on Digital Camera, Adaptive Cruise control in a Car, Mobile Phone software for key inputs.

	Total hours to be taught	45 Periods				
TEX'	Γ BOOKS:					
1	Peckol, "Embedded system Design", John Wiley & Sons,201	0.				
2	2 Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013.					
3	3 Shibu. K.V, "Introduction to Embedded Systems", 2e, Mc graw Hill, 2017.					
REF	ERENCES:					
1	Raj Kamal, 'Embedded System-Architecture, Programming, l	Design', Mc Graw Hill, 2013.				
2	C.R.Sarma, "Embedded Systems Engineering", University Pr	ess (India) Pvt. Ltd, 2013.				
3	Tammy Noergaard, "Embedded Systems Architecture", Elsev	rier, 2006.				
4	Han-Way Huang, "Embedded system Design Using C8051",	Cengage Learning, 2009.				
5	Rajib Mall "Real-Time systems Theory and Practice" Pearsor	Education, 2007.				



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Course code 22MT15015 Objective(s)	Course Name MEDICAL MECHATRONICS To study how to measure biocher To know the need and technique To study the use of radiation for To study the various monitorine To study about recorders and a Students should be able to Study how to measure biocher Know the need and technique of Study the use of radiation for default of the study the various monitoring in	L 3 emical are of electronical are of electron	lectrica nostica uments ed equi nd varia	P 0 arious pal safety and the sused in the s	y in Hosperapy. in medica in medica	ical infoitals.	
Objective(s)	 To study how to measure bioch To know the need and techniqu To study the use of radiation for To study the various monitorin To study about recorders and a Students should be able to Study how to measure biochem Know the need and technique of Study the use of radiation for description 	aemical archical arch	0 and varients and varients and varients are trical sections.	oarious pal safet; and the sused in propertions physical part out pafety in afety in the safety in t	physiology in Hosperapy. in medicatin medicatysiologica	itals. il ine. al infor	Formation
	 To know the need and technique To study the use of radiation for To study the various monitoring To study about recorders and a students should be able to Study how to measure biochem Know the need and technique of Study the use of radiation for description 	ne of electrical architecture.	lectrica nostica uments ed equi nd varia	and the sused in the sused in the interest in	y in Hosperapy. in medica in medica	itals. il ine. al infor	
	 To study the use of radiation for the total t	or diag g instr dvance nical ar	nostic a uments ed equi nd varie	and the sused in t	erapy. in medica in medic	ll ine. al infor	mation.
	 Study how to measure biochem Know the need and technique of Study the use of radiation for d 	of elect	trical s	afety in	-		rmation.
	 Study about recorders and advantagement 		ents us	sed in r	nedical.		
UNIT-I	INTRODUCTION						(9)
electrodes fortheir three equipment	lectrode – electrolyte interface, electrone measurement, ECG, EEG, EMG – measurement failures and trouble shooting. BIO-MEDICAL SENSORS AND TO	achine	descri	ption –			
fiber-optic,photoel	rinciples Types – source of bioelectric lectric and chemical transducers – their nentation – Bio & Nano sensors & app	r descr	iption a				
UNIT-III S	SIGNAL CONDITIONING, RECO	RDIN	G ANI	DISF	PLAY		(9)
electrometer ampli	OC amplifier, power amplifier, and ifier, carrier Amplifier – instrument p Telemetry principles – Bio telemetry.			-			-
	MEDICAL SUPPORT						(9)

plethysonography - blood flow measurement by electromagnetic flow meter cardiac output measurement by dilution method – phonocardiography – vector cardiography. Heart lung machine – artificial ventilator - Anesthetic machine - Basic ideas of CT scanner - MRI and ultrasonic scanner - Bio-telemetry - laser equipment and application - cardiac pacemaker - DC- defibrillator patient safety - electrical shock hazards. Centralized patent monitoring system.

RECORDERS AND ADVANCED SYSTEMS

Oscillagraphic – galvanometric - thermal array recorder, photographic recorder, storage oscilloscopes, electronmicroscope. Biotelemetry, Diathermy, Audiometers, Dialyzers, Lithotripsy.

Total hours to be taught

45 Periods

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TEX	T BOOKS:
1	SiamakNajarian "Mechatronics in Medicine – A Bio medical engg approach", McGraw – HillEducation, 2011.
2	Cromwell, Weibell and Pfeiffer, "Biomedical Instrumentation and
	Measurements", 2ndEdition, Printice Hall of india, 1999.
3	Arumugam M., "Bio Medical Instrumentation", Anuradha agencies Pub., 2002.
REF	ERENCE:
1	Khandpur, R.S., "Handbook of Biomedical Instrumentation", TMH, 1989.
2	Geddes L.A., and Baker, L.E., "Principles of Applied Bio-medical Instrumentation", 3rd
2	Edition, John Wiley and Sons, 1995.
3	Tompkins W.J., "Biomedical Digital Signal Processing", Prentice Hall of India, 1998.



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Course code	Department Mechatronics Programme Code & Name 1101 &						
	Course Name	Hours/week			Credit	Maximum Marks	
22MT15016	ENGINEERING	L	T	P	C	100	
22MT15016	THERMODYNAMICS	3	1	0	4	100	
Objective(s)	 The laws of thermodynamics Types of I.C engines, air contransfer methods are introduced 	nditionin			ration tec	hniques and hea	
Outcome(s)	The students will be able to 1. Apply the thermodynamics la and refrigeration equipment.	nws in th	e desig	gn of I.	C engines.	, air conditionin	
UNIT-I	FIRST LAW OF THERMODYNA	MICS				(9+3)	
cycle. Units – pre internal energy, s	s – microscopic and macroscopic point essure, temperature – Zeroth law. First specificheat capacities CV and CP – er	law – ap					
UNIT-II	SECOND LAW OF THERMODY	NAMIC	CS			(9+3)	
	hermodynamics – statements – equiv reversibility, reversible cycle – Carno				nk and Cla	nusius statement	
UNIT-III	INTERNAL COMBUSTION ENG	SINES				(9+3)	
diagram - Compa Fuel supply syste IHP, FP - Ignitic	IC engine - IC engine components and arison of two stroke and four stroke engems, total fuel consumption, specific on Systems, Lubrication system, Cooli	gines, C fuel con ing syste	ompar sumpt m, MI	ison of ion, m PFI, D	petrol & echanical	diesel engine, efficiency, BHI	
UNIT-IV	REFRIGERATION AND AIR-CO					(9+3)	
refrigerant selec temperature, wet	efrigeration, refrigerator& heat puntion, vapour compression refrigeration to bulb temperature, relative humidity, le-humidification, air coolers, cooling	ion cycl , comfor	e, vap	our a	bsorption	cycle, dry bull	
UNIT-V	HEAT TRANSFER (Qualitative T	`reatmeı	nt Onl	y)		(9+3)	
dimensional heat surfaces Fins. Pr pin fin, fin effic	rough conduction and convection, For the conduction through plain walls, comproblems on heat transfer through rectainness, fin effectiveness. Heat transfer shape factor. Types of Heat Exchange Total hours	nposite v angular through ers.	valls, o fin, tr radiat	cylinde iangulation, St	er walls, s _l ar fin, cir	pheres. Extended cumferential fire	
TEXT BOOK:	1 our nours						
	'Engineering Thermodynamics' Ta	ta McGr	aw-Hi	11 200	5		

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Department of Mechatronics
Mahendra Engineering College

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REF	ERENCE:
1	Michael A. Boles, Yunus A. Cengel, Yunus Cengel, 'Thermodynamics', 2nd Edition, McGraw-HillIndia, 2006.
2	Dr. C.P. Kothandaraman, S.Domkundwar & A.V.Domkundwar, 'A course in Thermal Engineering' DHANPATRAI & CO (P) LTD, Fifth edition, 2000.
3	Dr. C.P.Kothandaraman, 'Heat and Mass Transfer', New Age International (P) Publishers, 2002.
4	Holman.J.P., 'Thermodynamics', 3rd Ed. McGraw-Hill, 2000.



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Department	Mechatronics	Programme Code & Name 1101 & Mo						
Course code	Course Name	Н	ours/w	veek	Credit	Maximum marks		
22MT15017	MAINTENANCE ENGINEERING	L 3						100
 To enable the student to understand principles, functions and practices adapted in industry for successful management of maintenance activities. To explain the different maintenance categories like Preventive maintenance, condition monitoring, repair of machine elements. To illustrate some of the simple instruments used for condition monitoring inindustry. To study the basic repair methods and Failure analysis. To enable the student job order and maintenance. 								
Outcome(s) UNIT-I	The students will be able to 1. Upon completion of the programme, the students can able to implement the maintenance function. 2. Student will able to different practices in industries for the successful management of maintenance activities. 3. The Student will able to identify the different maintenance categories likePreventive maintenance, condition monitoring. 4. Student will able to repair methods and failure analysis. 5. Student will learn job order and material handling equipment.							
Type of maintena – MTBF, MTTR	PLANNING of maintenance planning – Objectives ance – Benefits of sound Maintenance R, MTTF and FIT– Factors of availabil	system	s – Re	liabilit	ty and mad	chine availability		
economics. UNIT-II	MAINTENANCE POLICIES – PRI	EVEN	TIVE	MAIN	TENANC	E (9)		
Maintenance cat maintenancesche UNIT-III	egories – Comparative merits of each or edules, repair cycle – Principles and me CONDITION MONITORING	categor thods o	y – Pro of lubri	eventiv cation	ve mainten – TPM.	(9)		
Methodsand instanalysis.	coring – Cost comparison with and with cruments for CM – Temperature sensitive	e tapes	s – Pist	ol ther	mometers	– wear-debris		
UNIT-IV	REPAIR METHODS FOR BASIC					(10)		
_	for beds, slide ways, spindles, gears, lear development – Logical fault location is				_	•		
UNIT-V	REPAIR METHODS FOR MATEI	RIAL I	IAND	LING	EQUIPM	IENT (8)		
Repair methods computers in ma	for Material handling equipment - Equi intenance. Total hours t			s –Job		ems -Use of Periods		

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TEX	T BOOKS:
1.	Srivastava S.K., "Industrial Maintenance Management", - S. Chand and Co., 1981
2.	Venkataraman.K "Maintancence Engineering and Management", PHI Learning, Ltd., 2007
REF	ERENCE:
1.	Bhattacharya S.N., "Installation, Servicing and Maintenance", S. Chand and Co., 1995
2.	White E.N., "Maintenance Planning", I Documentation, Gower Press, 1979.
3.	Davies, "Handbook of Condition Monitoring", Chapman & Hall, 1996
4.	"Advances in Plant Engineering and Management", Seminar Proceedings – IIPE, 1996



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Department Mechatronics Programme Code & Nam				me ame	1	101 & MCT
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks
22MT15018	ENTREPRENEURSHIP DEVELOPMENT	L 3	T 0	P 0	C 3	100
Objective(s)	To develop and strengthen enand to impart basic entreprene efficiently and effectively.					
Outcome(s)	1. Upon completion of the course skillsneeded to run a business			ll be a	able to ga	n knowledge and
UNIT-I	ENTREPRENEURSHIP					(9)
-	Types of Entrepreneurs – Different in Economic Growth, Factors Affecting					and Intrapreneur
UNIT-II	MOTIVATION					(9)
Programs – Need UNIT-III Small Enterprise Formulation – Supportunity, Ma	BUSINESS es – Definition, Classification – Characters involved in setting up a Busine rket Survey and Research, Techno Eco. Project Reports – Project Appraisal	racteri ss – io	stics, (dentify	Owner ing, so	ship Stru electing a Assessme	(9) ctures – Project Good Business nt – Preparation
UNIT-IV	FINANCING AND ACCOUNTING					(9)
	of Finance, Term Loans, Capital Str Costing, Break Even Analysis, Taxation					_
UNIT-V	SUPPORT TO ENTREPRENEURS				<u> </u>	(9)
- Business Incul	ll Business – Concept, Magnitude, Ca bators – Government Policy for Small S nsion, Diversification, Joint Venture, Me	Scale E	Enterpri	ises –	Growth St	
	Total hours to	be tai	ught		45	Periods
TEXT BOOKS						
1 Khanka. S	S.S., "Entrepreneurial Development" S.G.	Chand	& Co.	Ltd.,R	am Nagar,	New Delhi, 201
2 Donald F Learning,	Kuratko, "Entreprenuership – Theory 2014	, Proce	ess and	Pract	ice", 9th e	edition, Cengage
						^

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REFERENCE:

1 Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.

2 Mathew J Manimala, Enterpreneurship theory at cross roads: paradigms and praxis"Dream tech, 2nd edition 2005.

3 Rajeev Roy, 'Entrepreneurship' 2nd edition, Oxford University Press, 2011.

4 EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.



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		Dr	ogram	mα				
Department	Mechatronics	Cod	le & N	ame	110	01 & MCT		
Course code	Course Name	Н	ours/w	eek	Credit	Maximum Marks		
22MT15019	QUALITY CONTROL AND	L	L T P C 3 0 0 3			100		
	RELIABILITY ENGINEERING		U	U	3			
Objective(s)	 To introduce the concept of SQC. Demonstrate the ability to design, use, and interpret control charts for attributes andvariables. To understand process control and acceptance sampling procedure and theirapplication. To learn the concept of reliability. To present a problem oriented in depth knowledge of Quality and Reliability Engineering. 							
Outcome(s)	 The students will be able to Understand the concepts of quality Prepare and analyze the varied improvement. Use plans for sampling and conducted Understand and carry out reliance Can identify different areas of 	ous ch	arts or of qual lata ana	metho	ods for qua	ality control and ement.		
UNIT-I	INTRODUCTION AND PROCESS	CON'	TROL	FOR	VARIABL	(10)		
SQC,Quality ass of control chart-	inition of quality, basic concept of qual urance, Quality control: Quality Cost-V uses of control chart – Control chart for y – processcapability studies and simple	ariatio or varia	n in pro ables –	ocess-c	causes of va art, R chart	riation –Theory and chart -		
UNIT-II	PROCESS CONTROL FOR ATTR	IBUT	ES			(8)		
	r attributes —control chart for non-confies— C and U charts, State of control and	_				cation in charts,		
UNIT-III	ACCEPTANCE SAMPLING					(9)		
– O.C. curves – p	ing – types – probability of acceptance producer's Risk and consumer's Risk. And LTPD- uses of standard sampling pla	AQL, L						
UNIT-IV	LIFE TESTING – RELIABILITY					(9)		
	jective – failure data analysis, mean fail	lure rat	e, mea	n time	to failure. n	` ` `		
	nazard rate – Weibull model, system i							
configuration -	simple problems. Maintainability and a on reliability test – O.C Curves.							
UNIT-V						(9)		
	QUALITY AND RELIABLITY ovements – techniques- use of Pareto and	alveie	_ desig	n for	reliahility	` '		
and standby redu	undancy – Optimization in reliability - roduct lifecycles.							
_	Total hours to	o be ta	ught		45 I	Periods		

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TEX	T BOOKS:				
1	Douglas.C.Montgomery, "Introduction to Statistical quality control" John wiley 4th edition2001.				
2	L.S.Srinath, "Reliability Engineering", Affiliated East west press, 1991.				
REF	REFERENCE:				
1	John.S. Oakland. Statistical process control", Elsevier, 5th edition, 2005.				
2	Connor, P.D.T.O., "Practical Reliability Engineering", John Wiley, 1993.				
3	Grant, Eugene. L "Statistical Quality Control", McGraw-Hill, 1996.				





UNIT-IV

WIND ENERGY

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Department	Mechatronics	Programme Code & Name		1101 & MCT		MCT	
Course code	Course Name	I	Hours/week Credit			N	Aaximum marks
22MT15020	RENEWABLE AND NON-	L	T	P	C		10
2211113020	RENEWABLE ENERGY SOURCES	3	0	0	3		0
 Providing an overview of Power Plants and detailing the role of Engineers in theiroperation and maintenance. Understand the basic concept of Hydro electric energy conversion and its differe types. To explain the operation of Nuclear Energy System Understand the basic concept of solar photovoltaic energy and utilization of renewableenergy sources. Understand the basic concept of wind energy and bio mass energy and different types. 					d its different		
The students will be able to 1. Get the exposure on Hydroelectric and other conventional sources. 2. Modify the working of power plants and their performance. 3. Predict the types and principles of solar energy. 4. Demonstrate the types and principles of Wind energy. 5. Acquire the knowledge about of Biomass energy.							
UNIT-I	INTRODUCTION OF CONVENTI			-	STEMS		(9)
for steam turbin	thermal power plant – layout, working, efficiency. Gas turbine power plant power plant, comparison, efficiency. HYDRO AND NUCLEAR ENERG	– layou	t, worki				or simple and
Hydro Electric plants : Types, energy conversion schemes, environmental aspects – Hydro-Thermal coordination. Ocean Energy Technology, Tidal energy – Wave energy – Open and closed OTEC Cycles, Nuclear power plants: Fuels, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANadaDeuterium-Uranium reactor (CANDU), nuclear waste management.							
UNIT-III	SOLAR ENERGY					T	(9)
Energy Conservation and Energy Efficiency – Needs and Advantages, Different types of Renewable Energy Sources. Solar Flat plate and concentrating collectors – Solar heating and cooling techniques – Solar desalination – Solar Pond – Solar cooker – Solar Drying – Solar pumping – Solar thermal power plant – Solar photo voltaic conversion – Solarcells – PV applications.							

(9)

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Wind energy conversion, General formula -Lift and Drag- Basis of wind energy conversion - Effect of density, frequency variances, angle of attack, and wind speed. Windmill rotors Horizontal axis and vertical axis rotors. Determination of torque coefficient, Induction type generators- working principle.



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UNIT-V		BIOMASS ENERGY	(9)					
	Biomass direct combustion – Biomass gasifier – Biomass: Types – Advantages & Drawbacks - Biogas plant – Ethanolproduction — Biomass applications.							
	Total hours to be taught 45 Periods							
TEX	T BOOKS:							
1.	Power ger	neration engineering by Dr.G.K.Vijayaraghavan, Lakshmi Publication-New E	dition.					
2.	G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, New Delhi, 1999.							
3.	S.P. Sukh	atme, Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi	, 1997.					
REF	ERENCE:							
1.	G.D.Rai, "Non-conventional energy sources", Khanna publishers, Fourth Edition, 2004.							
2.	Abbasik "Renewable Energy Sources and their Environment", PHI, 2008.							
3.	G.N. Tiwari, Solar Energy – Fundamentals Design, Modelling and applications, Narosa Publishing House,							
	New Delhi, 2002.							
4.	Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.							
5.	www.nptelvideos.in/2012/11/energy-resources-and-technology.html,							
6.	https://nptel.ac.in/courses/121106014/3							
7.	https://nptel.ac.in/downloads/108108078/							



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Department	Mechatronics	Programme Code & Name		1101 & MCT			
Course code	Course Name	Hours/week		Credit	Maximum marks		
22MT15021	BUILDING AUTOMATION	L	T	P	C	100	
2211113021		3	0	0	3	100	
Objective(s)	This course provides theoretical and practical aspects of implementing automation in industry. This course offers learning of pneumatics/ hydraulics systems, electrical controls and Programmable logic controllers.						
	At the end of the course, students will be	able t	0				
	Illustrate the need and concept of	buildi	ing auto	omation			
Outcome(s) • Prepare the specification and select components of building automation system						nation system	
0 0.0001110 (3)	Implement the plan for building automation.						
UNIT-I	INTRODUCTION (6)						

Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS.

UNIT-II FIRE ALARM SYSTEM **(12)**

Fundamentals: What is Fire? Fire modes, History, Components, and Principles of Operation.

FAS Components: Different fire sensors, smoke detectors and their types, Fire control panels, design considerations for the FA system.

Field Components, Panel Components, Applications.

FAS Architectures: Types of Architectures, Examples.

FAS loops: Classification of loops, Examples.

Fire Standards: FAS Design procedure in brief, NFPA 72A, BS 5839, IS Concept of IP enabled fire & alarm system, design aspects and components of PA system.

ACCESS CONTROL SYSTEM **UNIT-III**

(9)

Access Control System: Access Components, Access control system Design.

CCTV: Camera: Operation & types, Camera Selection Criteria, Camera Applications, DVR Based system, DVM, Network design, Storage design.

Components of CCTV system like cameras, types of lenses, typical types of cables, controlling system.CCTV Applications.

UNIT-IV SECURITY SYSTEMS

(9)

Fundamentals: Introduction to Security Systems, Concepts.

Perimeter Intrusion: Concept, Components, Technology, Advanced Applications. Security Design: Security system design for verticals.

Concept of automation in access control system for safety, Physical security system with components, RFID enabled access control with components, Computer system access control – DAC, MAC, RBAC.



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UNIT-V ENERGY & BUILDING MANAGEMENT SYSTEM (9)
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ASHRAE Symbols - Energy Management: Energy Savings concept & methods, Lighting control, Building Efficiency improvement, Green Building (LEED) Concept & Examples.

Building Management: IBMS (HVAC, Fire & Security) project cycle, Project steps BMS. Verticals:

Advantages &	Applications of	BMS, Examples	Integration:	IBMS -	- Architec	ture, Normal	& Emergency
operation. Adv	vantages of BMS.						
		Tota	al hours to be	taught		45 Pe	riods

REFERENCE:

- Smart Buildings by Jim Sinopoli, Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.
- Understanding Building Automation Systems (Direct Digital Control, Energy Management, Life Safety, Security, Access Control, Lighting, Building Management Programs) by Reinhold A. Carlson, Robert A. Di Giandomenico, pub. by R.S. Means Company, 1991.
- Intelligent Building Systems by Albert Ting-Pat So, WaiLok Chan, KluwerAcademic publisher,3rd 3. ed..2012.
- Design of Special Hazards and Fire Alarm Systems by Robert Gagnon, Thomson Delmar Learning; 4. 2nd edition, 2007.
- 5. Process Control- Instrument Engineers Handbook by Bela G. Liptak, Chilton book company.

List of Open Source Software/learning website:

http://nptel.ac.in/video.phphttps://buildingsol

utions.honeywell.com/en-

US/Pages/default.aspxhttp://www.isa.org

http://www.controleng.com/

http://www.schneider-

electric.com/b2b/en/solutions/system/s1/buildings-

systems.jsphttp://www.automation.siemens.com/

http://coep.vlab.co.in/?sub=33&brch=97

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Department	Mechatronics	Progr	amme	01 & MCT			
Course code	Course Name	Н	Hours/week			Maximum marks	
22MT15022	MODELING AND SIMULATION	L 3			C 3	100	
Objective (s)	 To explain the basic concepts of building a model, study of simulation and systems. To study about the generation of random numbers, testing of random 						
Outcome(s)	Student should be able to 1.Define the simulation and its importance in creation of models for real time systems. 2.Describe the different types of systems. 3.Simulate the real time systems by generating the random numbers and variables. 4.Design and analyze the model using simulation software packages.						
UNIT I	5.Study about various simulations SYSTEM AND SYSTEM ENVIR					(9)	
study; Simulati	Component of a System – Continuous and discrete systems – Types of model; Steps in Simulation study; Simulation of an event occurrence using random number table – Single server queue –two server queues – inventory system.						
Properties of random numbers – Generation of Pseudo – random numbers – techniques of generating pseudo random numbers; Test for random numbers: the Chisquare test-the kolmogrov Smirnov test – Runs test – Gaptest – poker test.							
UNIT III RANDOM – VARIATE GENERATION (9)							
Inverse transform technique for Exponential, Uniform, triangular, weibull, empirical, uniform and discrete distribution, Acceptance rejection method for Poisson and gamma distribution; Direct Transformation for normal distribution. UNIT IV ANALYSIS AND EVALUATION OF MODEL (9)							
Data collection, identifying the distribution, Parameter estimation, goodness of fit tests, verification andvalidation of simulation models.							



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UNIT V	SIMULATION SOFTWARE PACKAGES	(9)
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Comparison and selection of General Purpose Simulation System (GPSS), SIMSCRIPT, SLAM, Arena simulation language, Modeling basic operations using Arena – An Electronic Assembly and testing system, Development of simulation models using Arena simulation package for queuing system, Production system, inventory system, Arena Integration and customization. Simulation Case Study of a Metal-Parts Manufacturing Facility.

syst	em, Production system, inventory system, Arena integration ar	id customization. Simulation Case					
Stuc	ly of a Metal-Parts Manufacturing Facility.						
	TOTAL HOURS	45 Periods					
TEX	T BOOK:						
1	Banks J., Carson J.S. and Nelson B.L., "Discrete – Event Sys	tem Simulation", , Pearson					
1.	Education, Inc3rd Edition, 2005.						
REF	ERENCE:						
1.	David Kelton.W. and Randall P. Sowdowski, "Simulation with Arena", , McGraw Hill, 2nd						
1.	Edition, 2002.						
2.	Geoffrey Gorden, "System Simulation", Prentice Hall of India, 2003.						
3.	NarsinghDeo., "System Simulation with Digital Computer", Prentice Hall of India, 2003.						